

Title: *The Internet*

Subject Area: Computer Science

Grade Level: 2 (suitable for 8 and older)

Related Standards of Learning:

CSTA K-12 Computer Science Standards

CPP - Computing Practice & Programming

CT - Computational Thinking

ISTE Standards for Students

1 - Creativity and Innovation

2 - Communication and Collaboration

4 - Critical Thinking, Problem Solving, and Decision Making

6 - Technology Operations and Concepts

Common Core English Language Arts Standards

L – Language

SL - Speaking & Listening

Common Core Math Standards

G – Geometry

MP - Math Practices

Classroom Set-up:

1. Unplugged (taught without the students needing a computer),
2. Projector for Powerpoint slides and videos

Objective:

Learning more about the internet will help students develop a better understanding of its endless possibilities.

Students will be able to:

- Learn about the complexity of sending messages over the internet.
- Translate URLs into IP Addresses.

Summary:

Even though many people use the internet daily, not very many know how it works. In this lesson, students will pretend to flow through the internet, all the while learning about

connections, URLs, IP Addresses, and the DNS. Learning more about the internet will help students develop a better understanding of its endless possibilities.

Please refer to <https://curriculum.code.org/csf/course/16/> **Lesson 16: The Internet** for a complete description of this activity.

Vocabulary:

This lesson has several new and important words:

- IP Address - Say it with me: I-P Add-ress

A number assigned to any item that is connected to the Internet

- DNS (Domain Name Service) - Say it with me: D-N-S

The service that translates URLs to IP addresses

- URL (Universal Resource Locator) - Say it with me: U-R-L

An easy-to-remember address for calling a web page (like www.code.org)

- Internet - Say it with me: In-ter-net

A group of computers and servers that are connected to each other

- Servers - Say it with me: Ser-vers

Computers that exist only to provide things to others

- Fiber Optic Cable - Say it with me: Fye-ber Op-tic Cay-bl

A connection that uses light to transmit information

- Wi-Fi - Say it with me: Wye-Fye

A wireless method of sending information using radio waves

- DSL/Cable - Say it with me: D-S-L / Cay-bl

A method of sending information using telephone or television cables

- Packets - Say it with me: Pack-ets

Small chunks of information that have been carefully formed from larger chunks of information

Lesson Tip

A quick preview is all you need here. These words will all be explained as part of the lesson, so it would be far less confusing to do a brief intro to the words as a "see if you can spot these during the day" type of heads-up.

Materials:

Thick poster paper that kids can hold up, black marker. Can be bought at Michaels or any stationery store.

Description: A5- Poster paper cut in half

Quantity: 2-4 groups x 2

Two sets of cards, one for IP addresses and the other Delivery type. See Below. Alternatively, you can just write the IP address directly on the card (instead of a number).

 Internet IP Address Cards 	
<p>These cards correlate with numbered entries in the DNS Table. (You should make one distinct row for each group.)</p>	
1	2
3	4
5	6
Revision 150517.1a	

U

Internet

Delivery Type Cards

C

O

D

E

**These cards correlate with different methods of delivering messages over the Internet.
(Print enough to have one card for each group.)**

Wi-Fi	Fiber Optic
DSL	Cable

Types:

- 1) **Wi-Fi:** Convenient, but spotty. Wi-Fi doesn't require cables, but since the signal bounces all over the place, packets can get lost pretty easily.
Simulation: Internet must carry each packet on their shoulder (no hands).
- 2) **Cable/DSL:** Fairly good at delivering messages, but you must be connected to a wire.
Simulation: Internet must carry each packet on the back of one hand and must keep the other hand touching a wall, desk, chair or the floor at all times.
- 3) **Fiber Optic Cable:** The best at delivering messages, but you must be connected to a wire.
Simulation: Internet can carry packets in hand, but must keep the other hand touching a wall, desk, chair or the floor at all times.

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Procedure:***Warm Up (20 min)***

Getting the Message

- It's quite likely that your students are aware of what the internet is, but they may not really understand what the internet does.
 - Ask "What is the internet?"
 - Is the internet a public place or a private place?
 - (Truthfully, many people think it can be both, but it should be viewed as a public space no matter what settings you think you've mastered.)
 - How does information get from place to place?
- Let's say that I want to look at the webpage for Code.org. What do you suppose the process would be like for me to send a message to request that page?
 - What do I do as a user?
 - What do you think happens inside the internet?

Sending a message over the internet is a lot like sending a message through the mail...if every letter we sent required thousands of envelopes!

Every message we send through the internet gets chopped up and each piece is wrapped in its own version of an envelope. We call those "packets." Packets are specially formed chunks of information that are able to easily flow through any of the internet's channels.

Sometimes, a few of those packets will get lost, because the internet is a crazy place. In that case, the packets need to be resent, and the whole message has to get put on hold until they arrive.

Where do you think those packets are headed?

- Even if you're sending messages to another person, they first have to go to at least one "server."
 - A server is a special computer that is supposed to be always on and ready to send and receive information.
 - Every website has a server.
 - Even email goes through servers.

Servers don't have names like you and I do. They're actually addressed using numbers. These numbers are called IP addresses, and they look a little strange.

- For example: One of Code.org's IP addresses used to be 54.243.71.82
 - (Please be sure to check this out in advance. Most IP addresses change from time to time and they are then reused for other sites.)

There are many ways to reach the internet from your house, school, or place of business.

- You can connect directly using a cable (that might be DSL, Cable, or Fiber Optic)
- Or you can connect using radio waves over the air through Wi-Fi

Direct connections are most reliable, but they can be inconvenient.

- Can you figure out why?
 - (You have to be attached to a cable!)

Wi-Fi connections are super convenient, but they aren't always reliable.

- Can you figure out why not?
 - (Radio waves bounce all over the place and can get lost.)

So, if you're used to sending information to URLs (like www.code.org) and the servers actually have IP addresses for names (like 54.243.71.82) how does the Internet change from one to the other? That's what the DNS is for. The DNS (Domain Name Server) has tables that allow the system to go back and forth between URLs and IP addresses. If the Domain Name Servers ever stopped working, it would shut down the internet as we know it!

With that said, let's try to understand what the DNS does by making a little DNS table ourselves. Pull out a piece of paper and draw a grid similar to that in the internet activity:

Sample of DNS Table: **(we only did 2 addresses to save time).**

#	URL	IP Address
1	code.org	54.243.71.82
2		
3		
4		
5		

First, we need to fill in this table.

- Survey the class for their favorite websites and write the URLs in the left column
- Use a site like get-site-ip.com to find the IP addresses for those sites and write them in the corresponding rows of the right column.

Now let's take this DNS Table and pretend to send messages through the internet!

Lesson Tip

There are some great YouTube videos on this subject that can make this lesson a little easier to understand. You can show them to the class in advance, or just watch them yourself. [Here is one of the most clear and entertaining versions.](#) (We recommend stopping the video at 2:59, if possible.)

Lesson Tip

If you're thinking that this is a lot of text and it would be extremely boring to try to lecture this to a class full of elementary school kids, you're absolutely right! If you're unable to show a YouTube video in class to help explain it all, I highly recommend drawing pictures to explain each idea above, or choosing students as volunteers to act out what you describe while you're explaining. They're not expected to get every detail and definition at this point, only to gain exposure.

At this point show them the “How the Internet works” videos. And the Lesson video which introduces the lesson to the students.

Main Activity (20 min)

The Internet

Directions:

Create your own DNS table, similar to what is shown above.

Have the class help you fill in the blank spots in the table. Pick your favorite URLs and find their IP addresses using a site like www.get-site-ip.com.

Divide into groups of 3 to 5 (**depending on number of students....we only did 2 groups**).

Assign each group an IP address from the newly created table, and assign each person in the group a position:

The Message Writer

The Internet

The Server (carries the IP address)

The Return Internet (optional) (**did not use this**)

The Message Receiver (optional) (**did not use this**)

Each group will draw an [IP Address Cards and Delivery Type Cards - Manipulatives](#) to find out where their message is going and what their method of message delivery (Wi-Fi, Cable/DSL, or Fiber Optic Cable) will be.

The Message Writer will craft a note to send to the server.

The Internet will rip the message up into 4 small pieces called packets, then deliver each packet one at a time to the Server with the IP address that was drawn from the IP Address Card stack.

The Server will make sure that the message arrives in order, then will send each packet off one at a time with the Return Internet (can be the same person or different person than the original Internet).

The Return Internet will deliver each piece back to the Message Receiver (can be the same person or different person than the Message Writer) and put it back together.

The Message Receiver will wait for all of the pieces to arrive, then read the message to be sure it arrived correctly!

Rules:

- The Internet must rip the message into exactly four packets.
- If the Internet drops a packet, they have to pick it up and go back to the start to deliver it again.
- The server has to wait for all of the message pieces to arrive before it can begin to send the message along.

Info:

- Wi-Fi: Convenient, but spotty. Wi-Fi doesn't require cables, but since the signal bounces all over the place, packets can get lost pretty easily.
 - Simulation: Internet must carry each packet on their shoulder (no hands).
- Cable/DSL: Fairly good at delivering messages, but you must be connected to a wire.
 - Simulation: Internet must carry each packet on the back of one hand and must keep the other hand touching a wall, desk, chair or the floor at all times.
- Fiber Optic Cable: The best at delivering messages, but you must be connected to a wire.

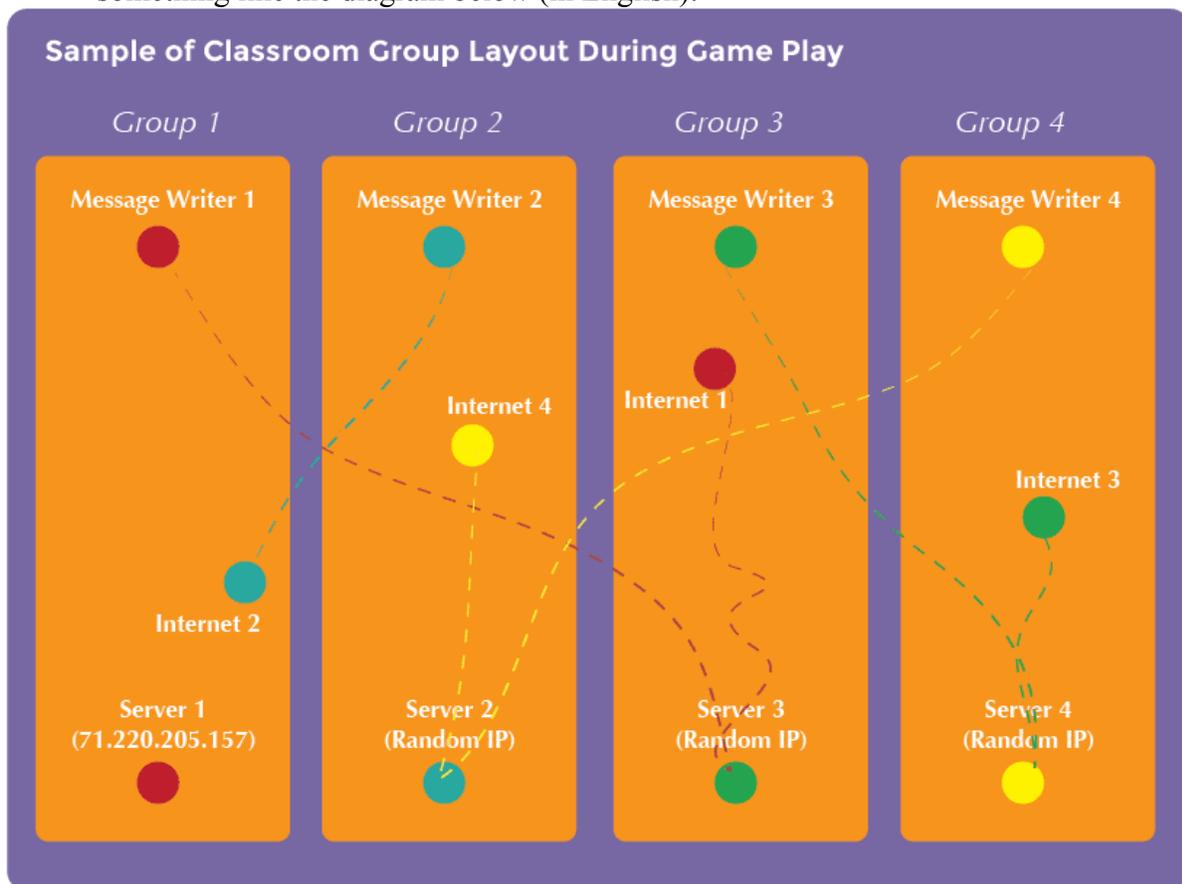
- Simulation: Internet can carry packets in hand, but must keep the other hand touching a wall, desk, chair or the floor at all times.

Lesson Tip

If it feels like there are too many rules to explain outright, feel free to post them on the board and just explain the game as you go. You can play multiple rounds until the class really understands.

To play this game, you can have your groups cluster anywhere, but for the first time it can be less confusing to have groups play in a line.

- Line up the "Servers" on one end of the room (holding their IP addresses). The Return Internet players can be over there as well (if you have that many people in each group).
- Have the everyone else line up across from their server at the other side of the room.
- The Message Senders will likely be sending their messages to a server other than their own, so the Internet players will likely cross over from group to group. It may look something like the diagram below (in English):





Internet

How the Internet Does What It Does



Directions:

- 1) Create your own DNS table, similar to what is shown here.
- 2) Have the class help you fill in the blank spots in the table.
Pick your favorite URLs and find their IP addresses using a site like www.getip.com.
- 3) Divide into groups of 3 to 5.
- 4) Assign each group an IP address from the table, and each person in the group a position:
 - * The Message Writer
 - * The Internet
 - * The Server (carries the IP Address)
 - * The Return Internet (Optional)
 - * The Message Receiver (Optional)
- 5) Each group will draw an IP address Card and a Delivery Card to find out where their message is going and what their method of message delivery (Wi-Fi, Cable/DSL, or Fiber Optic Cable) will be.
- 6) The Message Writer will craft a note to send to the server.
- 7) The Internet will rip the message up into small pieces called packets, then deliver each packet one at a time to the Server with the IP address that was drawn from the IP address Card stack.
- 8) The Server will make sure that the message arrives in order, then will send each packet off one at a time with the Return Internet (can be the same person or different person than the original Internet).
- 9) The Return Internet will deliver each piece back to the Message Receiver (can be the same person or different person than the Message Writer) and put it back together.
- 10) The Message Receiver will wait for all of the pieces to arrive, then read the message to be sure it arrived correctly!

Rules:

- 1) The Internet must rip the message into exactly four packets.
- 2) If the Internet drops a packet, they have to pick it up and go back to the start to deliver it again.
- 3) The server has to wait for all of the message pieces to arrive before it can begin to send the message along.

Slides to go along with lesson.

How does the Internet Work?

New Words!

IP Address

Say it with me: I-P-Add-ress

A number assigned to any item that is connected to the Internet

DNS (Domain Name Service)

Say it with me: D-N-S

The service that translates URLs to IP addresses

URL

(Universal Resource Locator)

Say it with me: U-R-L

An easy-to-remember address for calling a web page (like www.code.org)

Internet

Say it with me: In-ter-net

A group of computers and servers that are connected to each other

Servers

Say it with me: Serv-ers

Computers that exist only to provide things for others

Fiber Optic Cable

Say it with me: Fye-ber Op-tic Cay-bl

A connection that uses light to transmit information

Wi-Fi

Say it with me: Wye-Fye

A wireless method of sending information using radio waves

DSL/Cable

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A method of sending information using telephone or television cables

Packets

Say it with me: Pack-ets

Small chunks of information that have been carefully formed from larger chunks of information

How does the Internet Work?

- Lesson Video:
- <https://youtu.be/mFOUbgYv1Sc>
- How the Internet Works Video:
<https://www.youtube.com/watch?v=oj7A2YDgIWE>

Discussion:***Wrap Up (15 min)***

Flash Chat: What did we learn?

- What kind of connection would you rather have (Wi-Fi, DSL/Cable, or Fiber Optic)? Why?
- Why might it take your message a long time to get somewhere?

There is a lot of information in this lesson so adapt the information based on class size and level. We spent a major part of the lesson on the activity/game itself and explained the concepts as we went along. The students really enjoyed the activity!

References/Sources:

Activity was adapted from Code.org at
<https://curriculum.code.org/csf/courseee/16/>