(http://csmatters.org/pd-new)   P - 05

0bP - 0b101

Internet

Unit Pedagogy

Revision Date: Sep 08, 2019
Duration: 90 50-minute sessions

Lesson Summary

Summary: For this lesson, the teachers will review what students need to know about the Internet and act out the router simulation from lesson 3-3. Finally, teachers will review lessons from Unit 3 and identify (1) teacher challenges and (2) student learning challenges.

Outcomes:

Teachers will

- Review the Internet
- Act out the router simulations.
- Review and plan lessons for unit 3.
- Identify teacher and student learning challenges.
- Identify how concepts are scaffolded into a learning progression

Overview:

 (Total: 90 minutes)

1. Internet Review (10 min)
2. Group Activity (50 min)
3. Discussion (30 min)

Learning Objectives

Teacher Resources

Lesson Plan

TOTAL: 90 minutes

Internet Review (10 min)

Review and discuss what students need to know about the Internet in ppt slides 1-4.

Group Activity (50 min)

The facilitator of this session will guide how to conduct the simulation directly from the lesson 3-3 with the teachers.

Lesson 3-3

Activity Part A: Simulation of Packet Transfer

Transition Remark: Previously, we looked at the general structure of the Internet and how it works. Today, we will look more closely at the process of sending information between two locations using the Internet. Let's see what this looks like through a video(Code.org packets (https://www.youtube.com/watch?v=AYdF7b3nMto&index=4&list=PLzdnOPI1iJNfMRZm5DDxco3UdsFegvuB7)) or World of Science video (https://www.youtube.com/watch?v=Gfoc3Cxgnpk). (After video) We are going to simulate this same action by sending packets of information to each other without leaving our seats.

Introduction:

- Tell students that they will use rules, just like the Internet, called *protocols*. Compare the process followed by the Internet to get information from one place to another to the algorithms that they created previously (inputs of some type are given to the algorithm; it performs the same process on any information given; and then it produces a result). The protocols are applied to every packet of information that is sent. For this simulation, our protocol will have the structure "Recipient IP:_____, part # of total, Sender IP:_____ "
- On the Internet, the addresses are called Internet Protocol (IP) addresses. These addresses are made up of three numbers, and often correlate to your geographical location.   Today, you will each be given an IP address consisting of three letters. I have determined this address through your geographical location in the room. (As students participate in this activity, they will see the use of hierarchy. Most of their packets that begin with the same letter will go to the same general region, although there are a few that break this pattern.)
- Display the definition of TCP/IP (http://www.computerhope.com/jargon/t/tcpip.htm (http://www.computerhope.com/jargon/t/tcpip.htm)). Explain that there are many layers of protocols on the Internet from those that control hardware up to those that interact with application programs. Show the table of protocol hierarchy. (https://www.iplocation.net/tcp-ip (https://www.iplocation.net/tcp-ip))
- Your goal is to send a letter that I will hand out to the correct IP address, but here is the catch: Computers do not store the location of every IP address in the world. They are given the IP addresses of other coputers that are connected to them. Thus, you may only communicate with your neighbors to tell them your IP address. This must be done silently. (You may show them your IP address from your paper, or write it on a Post-It.)

- You can also ask your neighbors (via Post-It note) who they have access to, and your neighbors can ask the same question of their neighbors. In this way, you may find that you have access to someone else, but not know the route that the package must go to get there.
- On the back of your IP card, you have a table, which you should use to record how to get messages between yourself and different students in the class.
  - **Example:** We are going to attempt to transmit a package from B.B.A to C.B.D.
    - Student B.B.A - ask neighbors if they are C.B.D, or can get there.
    - This request should propagate through students until someone has found C.B.D.
    - C.B.D responds to their neighbor, who tells the neighbor who asked. This repetition should continue until the news has reached the original sender. B.B.A gives their message to the neighbor with the connection, and records on their paper who they went through to make the connection.
    - The message is passed on to C.B.D, who opens it, and reads it.
- Hand each student paper to serve as "packets," and allow them to send messages to one another. Make sure that they use the correct protocol on each message.
- Allow students to send packets that request information (what is your favorite ice cream, do you have siblings, etc.), and make sure that return packets are addressed and sent.

Activity Part B

Transition Remark: Our simulation of the protocol system on the Internet has been relatively tame. In reality, it doesn't always work this nicely. Sometimes packets are lost; not all the information you want to transmit fits in one packet; or some routers are unable to keep working. Fortunately, the Internet is full of redundancy that allows it to keep working even if some parts fail to work, and we can send large data sets through multiple packets. We're going to run our simulation again, but this time living in the "real world."

- Allow students to send messages to one another, but this time, as students transmit packets, mix them up a bit to simulate lost packets or unreadable data.
- Require students to find information from one another, but give them a character limit (like a text or tweet) for each packet that requires them to use multiple requests to send the information.
- Give IP cards some identifiable characteristic (print them on different color paper, put a sticker in the corner, etc.), and tell students with a particular characteristic that they are unable to connect to the network. Ask the remainder of the class to try to send messages without them. This will simulate the power of redundancy.

Discussion: How does redundancy of routers contribute to Internet fault tolerance?

- Some of your packets are getting lost! Sometimes this occurs in the middle of a multi-packet message. This is very frustrating, especially when we do not know whether all of our packets were received. How could we make our protocol system better in order for our Internet to run more smoothly?
  - This discussion should end with students deciding it would be nice to have a reply message such as "I got it!" with the number the packets that went together (1 of 3). The teacher should allow students to come to this conclusion on their own, but you may need to push them in this direction.
- Return to simulation, test your new protocols. (Spend no longer than 5 minutes.)

Discussion (30 min)

Small groups each take a lesson, discuss, identify (1) teacher challenges and (2) student learning challenges, share back and have group discussion.

> Review the content areas of the curriculum to reveal how content has been sequenced, paced and scaffolded to build students' understanding and their ability to transfer and apply knowledge and skills to new contexts. Share at least one sequence of 5 lessons that build on concept knowledge. (abstraction, representation, Internet, impacts, or other choice)

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