Packet Up: Data Delivery and Networks

Understanding Data Transfer Protocols

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Grade Level	7th Grade	**Time Frame**	45 minutes
Subject	Computer Science	**Duration**	1 Period
Course	Computer Science		

Essential Question

How does the internet work to share information?

Summary

In this lesson, students explore how data travels through the internet, define packages and protocols, and understand the best protocol for the type of data. Students put together puzzles to replicate how information is put into packets, watch an informational video on how networks work, compare two transfer protocols, and sort common programs into the best protocol for transfer. They end by reflecting on how their understanding of networks and data transfer has changed.

Snapshot

Engage Students assemble a puzzle, discover a missing piece, and compare this to data transfer on the internet.

Explore Students reflect on prior knowledge of what the internet is, how it works, and watch a video to expand their understanding of packets and protocols.

Explain Students learn more about the protocols, TCP and UDP, from an infographic and synthesize their learning in a Double Bubble Map.

Extend Students complete a card sort assessing which protocol they think common web applications use to share data.

Evaluate Students return to their "I Used to Think...But Now I Know" and share how their understanding of the internet and how information is transferred has changed.

Attachments

- Double Bubble Map Graphic Organizer—Packet Up.pdf
- Double Bubble Map Teacher Guide—Packet Up.pdf
- I Used to Think...But Now I Know—Packet Up - Spanish.docx
- I Used to Think...But Now I Know—Packet Up - Spanish.pdf
- I Used to Think...But Now I Know—Packet Up.docx
- I Used to Think...But Now I Know—Packet Up.pdf
- Lesson Slides—Packet Up.pptx
- Packet Puzzles Missing Pieces—Packet Up.docx
- Packet Puzzles Missing Pieces—Packet Up.pdf
- Packet Puzzles—Packet Up - Spanish.docx
- Packet Puzzles—Packet Up - Spanish.pdf
- Packet Puzzles—Packet Up.docx
- Packet Puzzles—Packet Up.pdf
- Sorting Tray—Packet Up - Spanish.docx
- Sorting Tray—Packet Up - Spanish.pdf
- Sorting Tray—Packet Up.docx
- Sorting Tray—Packet Up.pdf
- TCP and UDP Card Sort Teacher Guide—Packet Up.docx
- TCP and UDP Card Sort Teacher Guide—Packet Up.pdf
- TCP and UDP Card Sort—Packet Up - Spanish.docx
- TCP and UDP Card Sort—Packet Up - Spanish.pdf
- TCP and UDP Card Sort—Packet Up.docx
- TCP and UDP Card Sort—Packet Up.pdf
- TCP and UDP Infographic—Packet Up.pdf

Materials

- Lesson slides (attached)
- Packet Puzzles (attached; 1 copy per class)
- Packet Puzzles Missing Pieces (attached; 1 per class)
- Sorting Tray (attached; 1 per group)
- I Used to Think...But Now I Know (attached; 1 copy per student)
- TCP and UDP Infographic (attached; 1 per group)
- Double Bubble Map Graphic Organizer (attached; 1 per group)
- Double Bubble Map Teacher Guide (attached)
- TCP and UDP Card Sort (attached; 1 per group)
- TCP and UDP Card Sort Teacher Guide (attached)
- Paper
- Pens/pencils

15 minutes

Engage

Teacher's Note

Prior to the lesson, print out the **Sorting Tray** and **Packet Puzzles** handouts. Cut the pieces. Discard the white “missing piece” from each puzzle. Place each puzzle in its own envelope to hand out to students. Print one copy of the **Missing Piece** handout and reserve it for later in the activity.

Use the attached **Lesson Slides** to introduce the lesson. **Slides 3–4** share the essential question and lesson objectives. Put students into five groups. Display **slide 5**. Hand out a **Packet Puzzle** to each group. Give students time to put it together. They can use the **Sorting Tray** handout to help solve each puzzle. Students will notice they have a missing piece. Explain to students: “I have some spare pieces that could help with your puzzle. Is there a way you can request the piece you need without looking at what I have?” Give students time to brainstorm. Ask if any groups have ideas for how to request their missing piece. It is okay at this point if they do not or if they make a request that wouldn’t get them the piece they need. For example, if a group has the Tower of Pisa and says, “We need the top of the tower,” you could hand them the piece with the top of Big Ben. Ask students if they still know what their puzzle is a picture of? Explain that today they will learn about how information, like the pieces of their puzzle, travels through the internet and how protocols have been developed to make sure there aren’t as many “missing pieces.” Emphasize that in this case they could still tell what their picture was but in some cases losing an important piece of information could make everything unusable. For example, if they had been missing a larger piece of their puzzle or if a bank statement was missing the balance.

10 minutes

Explore

Move to **slide 6** and pass out the **I Used to Think…But Now I Know** handout to each student. Introduce students to the I Used to Think…But Now I Know instructional strategy. Ask them to just focus on the "I Used to Think" side of the handout. Give students a few minutes to write everything they know about the internet and how it works. Explain that this is just a starting point for the lesson and it is okay if there isn't much that they know yet.

Next, display **slide 7**. Show the Code.org video on packets and routing:

Embedded video
https://youtube.com/watch?v=AYdF7b3nMto

Ask students to share out something that was new to them or something that was explained in a new way. Point out that the video talked about a protocol called "TCP," then review with students what the video shared about this protocol and how it makes a "checklist" to ensure all information is shared. Explain that next they will learn about a similar protocol that wasn't in the video and how that differs from TCP.

Sample Student Responses

"Routers might go down, but the packets just take a different route and still arrive!"

"I didn't realize some packets fail to make it to my computer."

"I thought information came in order, not randomly and then reassembled."

"You can't just connect directly to Spotify to play a song because millions of people might be doing it at the same time."

"Even a single image might be lots of packets of information to transfer."

15 minutes

Explain

Move to **slide 8**, this slide displays a TCP & UDP infographic. Group students in teams of 3–4 students and hand out a copy of the **TCP & UDP Infographic** to each group. Explain that they will use this infographic to explore how these two protocols are similar and different using a Double Bubble Map. Make sure each group has a piece of notebook or unlined paper or use the **Double Bubble Handout.** Show **slide 9**, explaining that this is how they will set up their map but that they may need more or less bubbles depending on what they notice in the infographic. Use the **Double Bubble Map Teacher Guide** as needed to support student discussions. Give students time to read, reflect, record, and then share what they recorded in their map. Ask students why they think there are multiple protocols.

15 minutes

Extend

Now that students have learned about two common protocols, it is time to understand how they are applied in real-world computing. Move to **slide 10**. Introduce students to the Card Sort instructional strategy. Have students stay in their groups and pass out the **TCP and UDP Card Sort**. These cards have common media-rich websites students may have used. There are also blank cards that you can use if you would like for students to make their own suggestions of school-appropriate sites that could use these protocols. Give groups time to sort the cards by whether they think they primarily use TCP or UDP. Have groups share their sorts and their reasoning. Use the **TCP and UDP Card Sort Teacher Guide** as needed.

Teacher's Note

Video streaming sites like YouTube and Twitch often use both protocols: TCP is used for the site while the video streaming itself uses UDP. If you're unsure of where a student suggestion would go, ask them to justify their answer.

10 minutes

Evaluate

Display **slide 11.** Have students return to their desks and their "I Used to Think...But Now I Know" handout. Give students time to fill in their thoughts for the "But Now I Know" side of the chart. Ask how their understanding of the internet and how information is transferred has changed.

Teacher's Note

If time allows, return to the puzzle activity from the beginning of the lesson. Ask students how they could improve the transfer of all of the puzzle's information, including their missing piece, based on what they have learned about the transfer of data on the internet. What "protocols" could they put in place to locate their missing piece? If they are unsure, encourage considering how they could name each piece, or use "addresses" for the puzzle to make transfer easier. These ideas can be tested by students as a follow-up.

Resources

- Code.org. (2015, September 9). *The Internet: Packets, Routing & Reliability*. [Video]. YouTube. https://www.youtube.com/watch?v=AYdF7b3nMto&list=PLzdnOPI1iJNfMRZm5DDxco3UdsFegvuB7&index=4
- K20 Center. (n.d.). Card sort. Strategies. https://learn.k20center.ou.edu/strategy/147
- K20 Center. (n.d.). Double bubble map. Strategies. https://learn.k20center.ou.edu/strategy/3035
- K20 Center. (n.d.). I used to think...but now I know. Strategies. https://learn.k20center.ou.edu/strategy/137