Voyager's 15 Billion Mile Software Update

**** Basic **** Intermediate ****  Advanced

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| **Business/Materials** | **Lesson Objectives** | | | | |
| * YouTube video: "Voyager's 15 Billion Mile Software Update" (8:06 min) * Laptop/projector with speakers for video playback * Handout with vocabulary list and comprehension questions * Whiteboard/markers * Printed worksheets for guided practice * Role-play scenario cards (roles: NASA engineer, mission control, journalist) * Index cards for mnemonic device activity * Visual aids (pictures of Voyager, space, or computers) | By the end of the lesson, students will be able to:   1. Identify and use 5-7 key technical vocabulary words related to space probes and software updates (e.g., telemetry, thrusters, memory, code, software update, FORTRAN, Assembly).  * Demonstrate understanding of specific details from the video through intensive listening activities. * Engage in interactive speaking activities using mnemonic devices, mind palaces, imagery, and pronunciation practice to discuss and role-play scenarios related to Voyager’s software challenges. | | | | |
| **Warm-up and Objective Discussion (8 minutes)** | | | | | |
| * Activity: Start with a short discussion to activate prior knowledge. Write "Voyager Space Probes" on the board and ask: * Have you heard of Voyager 1 or 2? What do they do? * What challenges might engineers face when working with 50-year-old computers? * Show a picture of Voyager (from the web, if possible) to spark interest. * Explain Objectives: "Today, we’ll listen to a video about NASA updating Voyager’s computers from 15 billion miles away. We’ll learn new words, practice listening for details, and use special speaking strategies like mnemonic devices, mind palaces, and pronunciation to discuss and role-play the mission." | | | | | |
| **Instruct and Model** (10 minutes)[R, L] | | **** R | **** W | **** L | **** S |
| * Intensive Listening (Bottom-Up): Introduce 5-7 key vocabulary words from the video (e.g., telemetry, thrusters, memory, code, software update, FORTRAN, Assembly). Provide definitions and examples on a handout. * Example: "Telemetry means data sent from a spacecraft to Earth. For example, Voyager sends telemetry about its position." * Play the first 0:00-0:42 of the video (stop before "Just last year..."). Model how to listen for specific details: * "Listen for two programming languages mentioned. Write them down." (Answer: FORTRAN, Assembly) * New Speaking Strategy: Mnemonic Device (Highlighted):   1. Model creating a mnemonic to remember vocabulary (e.g., "To Memorize Code, Try Forming Awesome Software Updates" for Telemetry, Memory, Code, Thrusters, FORTRAN, Assembly, Software Update).   2. Students create their own mnemonic in pairs (1 minute) and share with the class. | | | | | |
| **Guided Practice** (12 minutes)[L, W] | | **** R | **** W | **** L | **** S |
| * Intensive Listening (Bottom-Up): Play 0:42-1:27 (problems with Voyager’s thrusters and telemetry). Provide a worksheet with gap-fill sentences: * Example: "Voyager 1 started sending back \_\_\_\_\_\_ telemetry data about its orientation." (Answer: garbled) * Students listen and fill in the blanks. Replay if needed. * Pronunciation Moment: Stress and Intonation for Technical Vocabulary (Highlighted)   1. Objective: Improve clarity in pronouncing technical terms.   2. Activity (4 minutes): Focus on three key vocabulary words: telemetry (TEL-em-etry), thrusters (THRUS-ters), and FORTRAN (FOR-tran).      1. Model: Write the words on the board, marking syllable stress (e.g., TEL-em-etry). Demonstrate correct stress and intonation, emphasizing how stress affects clarity in technical discussions (e.g., "TEL-em-etry sounds professional, not te-LEM-etry").      2. Practice: Students repeat each word after you, first chorally, then in pairs, exaggerating stress and intonation (e.g., "We fixed the THRUS-ters!").      3. Pair Task: Students practice saying a sentence in pairs using one word (e.g., "Voyager’s telemetry was garbled."). Pairs give feedback on stress and clarity. | | | | | |
| **Independent Practice** (15 minutes)[L, W, S] | | **** R | **** W | **** L | **** S |
| * Speaking Activity: Mind Palace Role-Play (Highlighted): * Students receive role-play scenario cards (e.g., NASA engineer explaining a “bit flip” to mission control, journalist interviewing an engineer). Example: * Engineer: Explain how to fix a bit flip using telemetry. * Journalist: Ask, “Why is Voyager’s code hard to update?” * Mind Palace Strategy: Before speaking, students spend 2 minutes creating a “mind palace” to organize their thoughts (e.g., imagine a room where “telemetry” is a glowing screen, “memory” is an old computer). They visualize key words in specific locations to recall during the role-play. * Pairs prepare a 2-minute dialogue (using 3+ vocabulary words) and perform for another pair, who provide feedback on vocabulary use. | | | | | |
| **Assessment (10 minutes) [L, W, S]** | | **** R | **** W | **** L | **** S |
| * Intensive Listening (Bottom-Up): Play 6:47-7:40 (Voyager updates and patches). Provide a multiple-choice quiz (4 questions) to test specific details: * Example: What happened in 2010 to Voyager’s memory? a) A bit flipped from 0 to 1 b) The memory was full c) The computer shut down (Answer: a) * Speaking Assessment: Imagery-Based Discussion Circle (Highlighted):   1. "Why is it amazing that Voyager’s computers still work after 50 years? Use at least 2 vocabulary words."   2. Imagery Strategy: Students imagine a vivid scene (e.g., Voyager floating in space, sending telemetry to Earth) to make their response more engaging. Example: “It’s amazing because Voyager’s memory still works, like an old computer in space sending telemetry across billions of miles.”   3. Assess fluency, pronunciation (especially stress on vocabulary like telemetry), and vocabulary use (rubric: 1 point for fluency, 1 for vocabulary, 1 for pronunciation clarity). | | | | | |