Dec. Grade 7 Unit 3B: Communication Systems

Content Area: **Science**
Course(s):
Time Period: **December**
Length: **3 Weeks**
Status: **Published**

Unit Overview

Communication systems have many parts that work together to send and receive messages. In this concept, you will learn about the different types of communication systems and how they work.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Describe the various types and parts of communication systems.
- Distinguish how communication systems can be applied to meet various communication needs.
- Contrast the use of digital and analog signals to send messages through communication systems.

Essential Questions

- **Overarching Question**
    - How are waves used to transfer energy and information?
- **Focus Question**
    - How are instruments that transmit and detect waves used to extend human senses?
- **Lesson Questions**
    - What are the parts and purpose of a communications system?
    - What communication systems do people use today, and how do they meet people's communication needs?
    - What are some advantages and disadvantages of sending communication using digital and analog signals?

- **Can You Explain?**
    - How do the parts of a communication system work together to send and receive messages?

Instructional Strategies & Learning Activities

DISCOVERY TECHBOOK LESSONS:

The Five E Instructional Model

- Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.
- ENGAGE (45–90 minutes)

  Students are asked to think about communication by imaging life without the Internet and cell phones. Students begin to formulate ideas around the CYE question.
- EXPLORE (180 minutes)

  Students examine the parts of communication systems, the systems used today, and advantages and disadvantages of digital and analog signals. Students also complete two Hands-On-Activities.
- EXPLAIN (45–90 minutes)

  Students construct scientific explanations to the CYE question by explaining how the parts of a communication system work together to send and receive messages.
- ELABORATE with STEM (20–80 minutes)

  Students make predictions about the cybersecurity industry. They also study twisted light and create a computer network.
- EVALUATE (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Integration of Career Exploration, Life Literacies and Key Skills

Students will explore the careers in the communication industry.

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
WRK.9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
CAEP.9.2.8.B.1	Research careers within the 16 Career Clusters ® and determine attributes of career success.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.DC.4	Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences.
TECH.9.4.8.IML.6	Identify subtle and overt messages based on the method of communication.
TECH.9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
TECH.9.4.8.IML.10	Examine the consequences of the uses of media (e.g., RI.8.7).
	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
	Multiple solutions often exist to solve a problem.
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.

Technolgy and Design Integration

Technology is fully integrated using Discovery Techbook.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
MA.7.EE.B	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.

Differentiation

See differentiation suggestions in the above lessons.

Struggling Students

1. Ask students which of the communication systems featured in the CIT they have had experience with. Can they describe some of the features of a given system and how it works?
2. Help students understand and make a scientific explanation. Model this process by developing a claim and a scientific explanation for a simpler question; for example, "Which brand of cell phone is most popular in the class?" Gather or make up some data or evidence, have students help you make a claim about the evidence, and, together, come up with an explanation. Explain what sound and logical reasoning and a reliance on evidence would look like for this example and help students formulate their own claim and explanation.
3. Have students discuss their experiences with digital media like CDs, MP3 players, USB drives, and similar hardware. Can they relate any of the concepts in the CIT to these experiences?

ELL

1. Discuss with students how language is a communication system and how their native language is different and unique, compared to the majority of students in the class.
2. Allow Spanish-speaking students to use the Spanish version of the Scientific Explanation Student Sheet.
3. Describe, show, and review examples of analog devices (analog wall clock, radio dial, traditional bathroom scale, traditional thermometer) and digital devices (digital watch, digital scale, digital thermometer).

Accelerated Students

1. Suggest students (individually or in pairs) begin work on a graphic illustration/model of a communication system. As the lesson progresses, they could add to and refine their model.
2. Have students make a poster or other graphical display showing the timeline of the development of digital media.
3. Have students research devices that can convert analog signals to digital signals and digital signals to analog signals.

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the

planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

Science Benchmarks are given in Dec. and June

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in the unit link above

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

See assessments located in the unit link above

Instructional Materials

See materials located in Unit above.

Discovery Techbook

Teacher made materials

Additonal labs available through NJCTL on line curriculum

Standards

SCI.MS-PS4	Waves and Their Applications in Technologies for Information Transfer
SCI.MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.