KEYS TO CONNECT

VIRTUAL FIELD TRIP

Discovering the Innovation of Supply Chain

LEARNING GOALS

- Students will reflect on prior knowledge and apply STEM concepts to supply chains and living in an interdependent world.
- Students will understand ways to create an efficient process using the power of movement to bring materials to market.
- Students will learn about careers tied to the intricacies of supply chains.
- Students will learn how car manufacturers reduce their carbon footprint through resupplying parts.

OVERVIEW

In the activities that follow, students will utilize new and existing knowledge to develop a sound understanding of the important role supply chain management has in today's business environment and the role it plays in promoting mobility for all. While students may not always notice the supply chain in action, these activities will help students connect STEM concepts in the supply chain to the world around them. In addition, students will become familiar with current supply chain management trends, how factors like inclusion and accessibility impact supply chains, and how changes have occurred over time to meet the growing demand for products. This Virtual Field Trip and supporting activities can also serve as a great starting point for taking part in the Keys to Connect Innovation Ignition Challenge. As you watch and learn, consider how mobility impacts every person and begin thinking about new innovations in mobility.

MATERIALS

- Paper, pencils, markers
- Supply Chains and Factors of Production capture sheet
- Moving to Market Capture guide
- Board Game Design notetaker
- Game materials (posterboard, color paper, glue, scissors, rulers)

PRE-VFT ACTIVITY

In preparation for the *Moving to Market Field* Trip, students will reflect on and explore the "what and why" of a supply chain. To begin, students will explore the steps and processes involved in making a product, from the resources needed through the production process to a final product that consumers can purchase. As a class, students will understand the importance of supply chain management and how it impacts our daily lives, even when we do not see it in action.

OBJECTIVES

Students will be able to:

- define and understand how a supply chain operates
- explore, explain, and apply principles that make up the supply chain process

PROCEDURE

1. To begin class, have students fold a piece of paper in half. On one side of the paper, have students create a list of all parts of a vehicle they can think of in about 1 minute. Students will probably be able to name a significant number of parts but may be surprised when they hear the total number of parts in an average vehicle. Next, have students use the other side of the paper to draw a diagram of the steps that they believe necessary to get a car from raw materials to the showroom floor.
2. Now, have the students count the number of parts they were able to name; you may also want to have them share a few examples. Ask students if they can estimate how many parts are in a typical vehicle. After a few guesses, share with students that an average vehicle can have anywhere from 20,000 to 30,000 parts. Explain that students will soon compare their diagrams with what they see in the Moving to Market Virtual Field Trip (VFT).
3. Next, write the following key words on the board: Raw Materials, Components, Production, Distribution, Consumption.
4. Ask students to consider the questions below and allow them to share their ideas with the class as they finish brainstorming:
    a. What do you think these terms mean?
    b. What might all the words together represent?
5. Write the words "Supply Chain" on the board. Explain to students that a supply chain is the steps and processes involved in making a product, starting from the resources needed and leading through the production process to a final product that consumers can buy.
6. Explain to the class that there are many steps required to create a vehicle and that they are going to learn more about the intricate process as they watch the Virtual Field Trip. To prepare for the VFT, students will get a chance to explore a sample of a supply chain of their own by selecting a product that they think is interesting. Examples might include a cellphone, piece of clothing, or something else they use on a regular basis. Provide each student with a copy of the Supply Chains and Factors of

Production capture sheet and ask students to explain what their product would need in each step of the supply chain.
Note: *This activity may be modified to select a common product as a group and research the steps as a whole class.*

7. Provide students 15 minutes to research and develop their responses. Students may not answer with specificity in each phase, but the exercise should give students a window into understanding the steps in a supply chain.
8. Next, ask students to share their supply chain steps with a partner in class and learn more about how other products make their way to consumers.
9. Finally, distribute to each student the Moving to Market Virtual Field Trip notetaker and explain that they will be using the VFT to identify important points in understanding how Toyota utilizes the supply chain process.

POST-VFT ACTIVITY

Following the *Moving to Market* Virtual Field Trip, students will discuss what they learned about supply chains and their application within Toyota. Next, students will discover how the supply chain can bring together infrastructure and technology to improve the quality of mobility. Working in collaborative groups, students will use their knowledge to design a sustainable supply chain game using materials/variables provided by their teacher. After completing the design challenge activity, students will reflect on the impact of supply chains and the concept of mobility.

OBJECTIVES

Students will be able to:

- understand and apply ways to create an efficient process using the power of movement to bring materials to market through the creation of a game
- implement the supply chain process

MATERIALS

- Poster board
- Markers
- Construction paper
- Other materials from around the classroom

PROCEDURE

1. After viewing the Moving to Market VFT, provide the students with time to complete their notetakers and with opportunities to ask probing or clarifying questions.
2. To help start the debrief conversation, consider using a few of the following questions:
    - Was there a particular interview or segment that resonated with you? Why?
    - Was there an interview or demonstration you heard or saw that helped you learn something new, such as why supply chains and technology play an integral role in bringing products to market?
    - Where did you see examples of using technology to reduce the carbon imprint?
3. Guide students to review their pre-VFT activity and their VFT notetaker to identify key components of supply chains.
4. Provide students will a central set of materials, such as poster board, markers, construction paper, straws, and popsicle sticks (most any supplies around the classroom).
5. Next, tell students that they will complete an activity simulating the challenge of moving a vehicle from raw materials through costumer purchase. Allow time for students to move into groups of two or three and distribute copies of the Board Game Design notetaker to each student.
6. Explain to students that the goal of their games will be to move the player through the supply chain process with high efficiency using information they have learned about supply chains. In doing so, they will need to make decisions like those made regularly by many businesses, reflected in the following questions, which they may use in the development of their games:
    - How do I meet the delivery deadline?
    - Will I make a profit?
    - How can I improve my supply chain?
    - How can I cut my carbon footprint?
7. After students have reviewed the planning sheet, provide the class about 20 minutes for planning. ***Note:*** *this time may be dependent on your class structure and available time. This may be an ongoing performance task.*
8. Upon completion of planning, allow students time to build their game structure and work through their questions. Remind students that the goal of the game will be to reflect on some of the major phases of bringing materials together to produce a finished product.

NEXT GENERATION SCIENCE STANDARDS AND ELA COMMON CORE

NGSS

- ETS1.B: Developing Possible Solutions: There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- MS-ETS1-4 Engineering Design: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

ELA

- CCSS.ELA-LITERACY.RI.6.1: Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- CCSS.ELA-LITERACY.RI.6.2: Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

SUPPLY CHAINS AND FACTORS OF PRODUCTION CAPTURE SHEET

A supply chain is the steps and processes involved in making a product, starting from the resources needed and leading through the production process to a final product that consumers can buy.

Raw Materials
The natural resources needed to manufacture the product.

Components
The tools, machines, computers, or equipment needed to make the product.

Productions
The numerous jobs that come together to create the product from raw materials.

Distribution
The transport system from factory, farms, and offices to consumers

Consumption
The final phase where products or goods are sold or purchased.

Name of product _____

Raw materials:

Components:

Production:

Distribution:

Consumption:

MOVING TO MARKET VFT NOTETAKER

The Virtual Field Trip highlights many ways mobility matters, what does mobility mean to you?

In your own words, describe what a supply chain is. What does it have to do with mobility?

Sketch an outline of the Parts Distribution Center below.

Did you hear the difference between “qualitative” and “quantitative” research? Why might this be important for creating better products and more efficient processes?

What kinds of machinery does Toyota rely on to gather its parts?

How does Toyota’s supply chain compare to the design you created at the beginning of class?

BOARD GAME DESIGN PLANNING NOTETAKER

Theme:

What images will support the theme? Write down words associated with the theme.

Brainstorm the Rules of the Game:

1. How does someone win? *(Consider using phases of supply chain management to accomplish a goal*.)
2. Players *(Who are the players? How many can play? Do players follow the same path?)*
3. What obstacles can be placed along the way to set the player back? *(Consider obstacles that may exist in a supply chain.)*
4. What strategies can the players engage in to be allowed to move forward? *(Consider rewarding players for efficiency, sustainability, accessibility, or innovation.)*

5. Design and sketch your start and end points. Where are the players at the beginning of the game and what is their goal and the purpose of the journey?

6. Design the board layout. Is the play field going to be a side view or a top view? What is the general shape of the path? What is the direction of the move (up, down, return to start, etc.)? Are there any hidden paths? Start sketching. Use additional paper to sketch out the game concept.