Transportation

**Focus:**

**Overview:**

Transportation is an important industry. There are jobs where you can drive transportation vehicles or where you can manage transportation fleets such as selling transportation capacity, working in management, or being someone who makes sure that the transportation mode goes to the places that you need it to be.

**Essential Questions:**

What is transportation? What are the five main modes of transportation? What are characteristics that help determine which mode of transportation should be used? Why is transportation important to an economy? How is transportation globally?

**Objectives:**

* Identify the five modes of transportation.
* Explain why transportation is important to the economy.

**Background Information for PowerPoint lecture:**

This lesson is set up with a PowerPoint that can be shown to introduce students to what transportation is and the importance to the U.S. economy. There are options provided to reinforce the lesson and to teach some additional concepts.

**(Estimated time: 15 – 20 minutes).** Teachers should add information below as part of their lecture.

Slide 2: The PowerPoint will provide information about the impacts of transportation to the overall economy. In addition, each of the transportation modes are explained. At the start of the lesson have students look around the room. Is there anything in the room that was built on the spot? Or was everything built elsewhere and moved to the school? Transportation brought these things to the school. How about the students themselves? Did their parents have weave the cloth their clothes are made out of? Students can look at the tags in their clothes and find out where they were made. Transportation brought their clothes to the store they were purchased at. What about other things students own such as their phone or computer? What about their car? Even if their car was made in the US, transportation brought the car to the dealership where they purchased it.

 Slide 3: There are five modes of transportation: Motor Carriers (trucking), Railroads, Air Carriers, Water Carriers, and Pipelines.

Slides 4 - 9: Students should be most familiar with trucking. The teacher could ask students what they know about trucking. Trucking is involved in bringing everything that was just talked about. Other modes might be involved, but trucking almost always brings items to their final destination. Trucking is the second most expensive mode after air. Students should be asked to differentiate the examples of the types of trucks. On Slide 6 the two main types of trucks are the line-haul vehicles that move between cities, while the city straight trucks are used only within a city. Slide 7 are types of line-haul vehicles. The dry van has enclosed tops and sides and hauls goods that need to be protected liked canned vegetables or furniture. The open top has enclosed sides but an open top and hauls products like grain. The flatbed has no top or sides and is used to haul lumber or steel. Slide 8 is the tank trailer. It is used to haul petroleum and gas. The refrigerated vehicle is temperature controlled. It moves things like ice cream or milk. Slide 9 has the high cube which is similar to the dry van except it is taller and has dropped section in the middle. This enables more goods to be hauled and improves wind resistance which reduces gas consumption. Liquefied gas moves things like propane or natural gas. The sides are thicker than those of a tank car. The automobile carrier is pretty self-explanatory – it hauls automobiles.

Slides 10 – 11: Students may have some familiarity with railroads. Many students believe that railroad is a dying mode. The truth is that railroads are shipping more products than ever. The number of railroads and the amount of track is decreasing, however the railroads that exist are larger than ever and are moving more tons than ever over longer distances. Jobs with this mode are the highest paid.

Slides 12 – 13: Students may have flown on an air carrier before. They may not be aware that passenger travel is considered part of the transportation industry. They also may not know that passenger planes also move freight in the belly of the plane. Have students noticed that there is a baggage fee for baggage that will go into the belly of the plane? If people are charged for luggage do they try to carry more luggage or less luggage? By charging the air carriers convince us to carry less luggage which creates more room for freight to be moved. Air carriers are a mode that can bring things from overseas. Usually all phones are brought to the US on air carrier.

Slides 14 – 15: Water carriers move freight both overseas and domestically. Most of the goods that come from overseas are moved on very large container ships. Containers are truckload size metal boxes that are stacked onto large ships. Most of the things like clothes or cars are brought from overseas. Overseas water carriers are an industry that is growing. There are fewer domestic water carriers than in the past. Water carriers carry a lot of freight, but they move very slowly. Cold weather can lead to ice on the water and water carriers cannot move. They are also at the mercy of droughts.

Slide 16: Pipelines generally carry natural gas or petroleum products. It takes very few people to operate a pipeline. The entire pipeline industry only employs 8,000 people. 8,000 sounds like a lot right? However, if trucking moved the same freight comparable miles then they would need 10,000,000 people to move the freight. As an example, the petroleum is pumped from the ground and moved through a pipeline to a holding station. Then it is pumped through a pipeline to a refinery. From the refinery it is pumped through a pipeline to holding tanks where it can be picked up and delivered to the local gas station. The gas you put in your car has been through at least one pipeline.

Slide 17: Intermodal combines two forms of transportation. This creates opportunities for cost savings. Trucking is usually involved as one of the modes, and it is one of the most expensive modes. By combining with railroads or water carriers, cheaper modes, the total cost of transportation can be decreased. There are entire intermodal divisions to work in for some large companies like JB Hunt.

Slide 18: Without transportation we would not have many of the things we use in our everyday lives.

Questions that can be asked at the end of the presentation about Arkansas companies:

* What are some major trucking companies founded in Arkansas? JB Hunt, ArcBest (Arkansas Best, ABF), Con-Way, and PAM. Students can look these companies up and make a report if an assignment is needed.
* Some companies have private fleets of trucks that deliver their goods. Can students think of some Arkansas companies that own large private fleets? Answer: Walmart, Tyson Foods. How are the trucks used? At Walmart, they deliver goods from Walmart’s distribution centers (private warehouses) to stores. At Tyson Foods, they are used to deliver chickens and feed to the farms. They are also used to deliver the processed chicken to distributors and store warehouses such as those for Walmart. Dillard’s also has a private distribution center where goods are delivered from a central warehouse to their stores.
* What modes of transportation does Murphey Oil use? Almost all of them! They use pipelines to transport their oil from fields to refineries. Railroads, barges, or trucks can ship the oil across the country. If the oil is shipped overseas it can be carried on an ocean carrier. Air carriers are not used in the delivery of the oil.

# The following are options of in-class activities that can be used to reinforce the PowerPoint.

**Option 1: My Truckin Luck Game (Estimated Time: 30 – 60 minutes)**

**Prepare:** You will need a copy of the game.

**Teach:**

This game introduces students to the trucking industry. The My Truckin Luck game can be purchased on Amazon.com. [https://www.amazon.com/My-Truckin-Luck/dp/B00LIJSZ6I/ref=sr\_1\_1?ie=UTF8&qid=1483155019&sr=8-1&keywords=my+truckin+luck+game](https://www.amazon.com/My-Truckin-Luck/dp/B00LIJSZ6I/ref%3Dsr_1_1?ie=UTF8&qid=1483155019&sr=8-1&keywords=my+truckin+luck+game) Cost: $23.50 with free Prime shipping

The game allows 8 people to play at once. A game board comes with 8 game pieces. The game board has a path across the US starting in Seattle, WA and ending in Miami, FL. The student will roll dice and advance the number of spaces rolled. Each player is given money to start the game. There are free spaces, but also spaces where a fine could be levied or spaces could be advanced. The goal is to reach Miami, FL. The first three players to arrive then compare money earned. The person with the most money wins the game. The game was developed by a real truck driver. The game exposes students to real situations that they would face either as a truck driver or managing a fleet of trucks.

**Option 2: Where do Dole bananas come from (Estimated Time: 10 minutes)**

**Prepare:** You will need access to a projector to show the PowerPoint.

**Teach:**

This PowerPoint introduces students to how large a water carrier actually is. The PowerPoint explains how bananas enter the US for Dole. Students will guess a series of questions such as the number of containers, number of boxes in each container, etc. After providing students with the correct answer, they will calculate the number of bananas that Dole imports in the year. Students will also guess the top 4 importers of containerized goods. Dole is # 5. Answers to questions are provided in the notes section for each slide of the Bananas PowerPoint. These container ships are actually very small compared to the largest container ships. The largest ships carry 18,000 containers. The three ships are in rotation and while one is in the San Diego port, another is at sea heading to San Diego, and one is picking up products.

This lesson helps students understand the size and amount of products that are imported into the US.

**Option 3: Video Lessons (Estimated Time: 2 – 45 minutes)**

**Prepare:** You will access to a projector and the Internet to show the videos.

**Teach:**

Each video is provided to give some insight into each one of the modes of transportation. They can be used when, before, or after the PowerPoint is presented. It is suggested to use them as each mode is shown as interest points for the students.

<http://www.youtube.com/watch?v=vNgAHOIofpI> Time: 1:23 This video shows the history of transportation beginning with cattle/wagon through airplanes. It helps students get a timeline of when transportation developed. Discussion Question: How has transportation changed during your lifetime? Or has it?

<https://www.youtube.com/watch?v=_jZwTq3ei5c> Time: 2:34 This video introduces a tv show called Ice Road Truckers. Ice Road Truckers are located in Alaska. They drive over frozen roads and lakes. There are not many roads in Alaska so frozen lakes are used to deliver goods via truck in the winter. In fact, most goods are delivered in winter when the lakes provide transport due to the lack of roads. Driving on ice requires special skill. This particular video shows some of the fun that the truckers have. This one does not contain curse words, others found did. Discussion Question: Why would truckers want to drive in the dangerous conditions of Alaska? Pay is a big part of it.

<https://www.youtube.com/watch?v=aIwbrZ4knpg> Time 6:31 This video introduces one of the most innovative trains – the Maglev. It runs by magnetic force and actually floats above the tracks. Disney World has trains like this. Discussion Question: Can students think of other innovations that are happening in transportation now? One possible answer involves drones. <https://www.youtube.com/watch?v=MXo_d6tNWuY> 2:16 This video shows drones in action for Amazon.

<https://www.youtube.com/watch?v=qOw44VFNk8Y> Time 4:38. This video is an in-flight safety video from Air New Zealand. It was the most popular one that could be found with over 16 million views. Many of them are entertaining, and this one features the Hobbit. If you want to show another just google in flight safety video and you should be able to find many from different airlines. Some of them are straightforward while some have entertainment value. Discussion Question: Where do air carriers rank in terms of safety out of the five modes? They are actually the safest mode. Because accidents involving aircraft can involve multiple deaths they make the news more frequently than other modes.

<https://www.youtube.com/watch?v=RUfGCngF9DI> Time: 9:09. This video shows what is involved in creating the world’s largest container ship with 18,000 containers. It gives students an idea of the scope of materials that are being imported into the US on an almost daily basis. Discussion Question: Name some of the things that might come to you via container ship.

<https://www.youtube.com/watch?v=iTXqJoCxh7w> Time: 1:47. This video explains the Keystone Pipeline in an unbiased way. Discussion Question: Have students list possible pros/cons of the Keystone Pipeline.

**Option 4: Operating and Service Characteristics (Estimated Time: 20 – 30 minutes)**

**Prepare:** You will need a pack of post-its for each student group.

**Teach:**

Service and Operating Components of Transportation

* Transit time (speed of service) – the time it takes to get from origin to destination.
* Reliability – The consistency of transit time.
* Accessibility – How easy is it for a mode or carrier to make pick-ups and deliveries to various locations?
* Capability – The ability of the mode or carrier to move a wide variety of freight, both in terms of type and quantity.
* Security – The possibility of loss or damage of freight while in transit
* Cost – How much is charged on average by a mode or service relative to other modes.
* Fuel efficiency – How energy efficient is the mode relative to others.

Break students into small groups of two or three students. Assign students a mode of transportation. You should have at least two groups that cover each mode. Provide students with the service and operating components on transportation list (above). Then provide students two different colors of post-it notes, or if using one color students should label one post-it strengths and weaknesses. Students should list which of the service and operating characteristics they think are strengths and weaknesses for each mode on a post-it and place it under strengths and weaknesses for the mode. They should put up the post-its on the board or a wall on opposite sides of the room from the other group working on the same mode. After students have assigned each mode the characteristics they should compare with the other group and reach a consensus on the right answer. They should then report their answers to the class.

Answers:

Motor Carriers:

Strengths: Accessibility, Reliability, Security, and Speed (Transit time)

Weakness: Cost, Fuel efficiency, capability

Railroads:

Strengths: Cost, Capability, Reliability, Fuel efficiency, and Moderate speed (Transit time)

Weakness: Accessibility, Security

Air Carriers:

Strengths: Speed (Transit time), Reliability, and Security

Weaknesses: Accessibility, Cost, Capability, Fuel efficiency

Water Carriers:

Strengths: Low cost, Capability, Fuel efficiency

Weaknesses: Speed (Transit time), Reliability, Capability, and Accessibility

Pipelines:

Strengths: Low cost, security, reliability, fuel efficiency

Weaknesses: Capability, speed (transit time), accessibility

Tip for large classes: A handout can be prepared listing the seven main service characteristics. Students can be asked to guess the characteristics that go with each mode. The goal is to get students to explore the modes.

**Option 5: True/False (Estimated Time: 5 – 15 minutes).**

**Prepare:** You need to be able to read the questions. Give each student a notecard if desired that they can write true or false on.

**Teach:**

Have students create a notecard that says true or false. After each question they should hold up the notecard. The questions are based upon information presented in the PowerPoint.

1. Railroads primarily move food. (False – Motor carriers do)
2. Container ships carry goods from countries such as China to the US. (True)
3. Transportation employs 9% of civilians in the US. (True)
4. Pipelines are one of the most expensive modes. (False – one of the cheapest).
5. An Apple iPhone is usually delivered via air carrier. (True)
6. Transportation accounts for 8.7% of US Gross Domestic Product (GDP). (True)
7. Air Carriers are the largest mode in terms of the weight of freight moved. (False – Motor carriers are).
8. Only two modes can move products from international locations. (True – the modes are Air Carriers and Water Carriers).
9. Motor Carriers generally deliver on time. (True)
10. Pipelines move oil and natural gas. (True)
11. Intermodal transportation always uses three or more modes of transportation. (False – you only need two or more or modes to be classified as intermodal).
12. Railroads usually deliver items on time. (True)
13. Diamonds are usually delivered via Water Carrier. (False – air carrier would bring them, then truck would deliver them to the store).
14. Pipelines can be moved from one part of the country to another as needed. (False – once built they are fixed).
15. Air Carriers are usually cheap to use. (False - they are expensive)
16. Motor Carriers can go just about anywhere to pick up and deliver freight. (True)
17. Water Carriers are able to be used anywhere. (False – you will need a waterway).
18. Air Carriers are very slow. (False – they are the fastest mode)
19. Motor Carriers primarily move all the goods you find in a grocery store. (True)
20. Railroads are very expensive to use. (False – they are cheap)
21. Motor Carriers generally play some role in the journey of all goods. (True)
22. Water Carriers move things like petroleum and gravel. (True)
23. Pipelines are one of the fastest modes. (False – one of the slowest)
24. Air Carriers are limited in the fact that airports are not everywhere. (True)
25. Motor Carriers can carry anything even super large items. (False – they are limited on size).
26. Water Carriers are one of the fastest modes. (False – they are one of the slowest).
27. The U.S. is the second largest exporter of merchandise. (True)
28. Railroads are in every city. (False – they are in every state, but there are limited locations)
29. With Air Carriers freight is not carried in the belly of passenger planes. (False – it is).
30. When truck and rail are used together in intermodal transportation this is called Trailer on a Flat Car (TOFC). (True)

**Option 6 – Transportation Game (10 – 45 minutes – depending on rounds and players)**

**Prepare:** Create one set of each of the columns. It is useful to use notecards that come four colors in a pack of 100.

**Teach:**

Make four sets of notecards. One set will be origin country, one will be mode of transportation, one will be product, and one will be destination country. Students will form groups. They will pull one card from each set. The goal is to find a mode of transportation that would deliver the selected product from the origin country to the destination country. Students will draw an initial set of four cards. They should keep their cards private from other groups. If anyone feels that they do have a match on first drawing, they would explain their cards. Students in the class would agree or disagree with the answer. If students do not have a hand that works they can discard one of their cards by placing it on the bottom of the correct category’s stack and draw another card. When they think they have a match they should explain their reasoning. After 10 draws if students don’t have a match yet, they should explain what it takes for them to have a match. Game can be played multiple times.

Cards to be made:

|  |  |  |  |
| --- | --- | --- | --- |
| Origin country | Transportation mode | Product | Destination country |
| USA | Motor Carriers | Diamonds | India |
| Great Britain | Pipelines | Corn (in bulk) | Nigeria |
| Mexico | Water Carriers | Coal (in bulk) | Israel |
| Canada | Railroads | Gravel (in bulk) | Egypt |
| Australia | Air Carriers | Leather | USA |
| New Zealand | Motor Carriers | Flowers | Vietnam |
| Kenya | Pipelines | Fresh Broccoli | Russia |
| China | Water Carriers | Apparel | Indonesia |
| Japan | Railroads | Shoes | South Africa |
| France | Air Carriers | Cars | Spain |
| Spain | Motor Carriers | Airplane parts (small) | France |
| South Africa | Pipelines | Airplane parts (large) | Japan |
| Indonesia | Water Carriers | Candy | China |
| Russia | Air Carriers | iPhones | Kenya |
| Vietnam | Motor Carriers | Blankets | New Zealand |
| USA | Pipelines | Big Screen TVs | Australia |
| Egypt | Water Carriers | Oranges | Canada |
| Israel | Railroads | Hand Sanitizer | Mexico |
| Nigeria | Air Carriers | Movies | Great Britain |
| India | Water Carriers | Lumber | USA |

Cards should be shuffled to create random pairings. USA was purposefully used twice.

Tips for a large class: Instructors can make PowerPoint slides and show students different combinations. Students would then determine if these pairings would work. A sample PowerPoint for use in class has been provided.

Answers: Motor Carriers, Railroads, and Pipelines can only be used on land based routes. There is a route from China to Europe that can be used by Railroads, however not by Motor Carriers or Pipelines. Air Carriers and Water Carriers are international routes. Large items should come via Water Carrier, an Air Carrier is not large enough to move them. Air Carriers are generally used for time sensitive or more expensive merchandise. Air Carriers are much more expensive to use than Water Carriers.

**Option 7 – Costs of Transportation (20 to 40 minutes)**

**Prepare:** Copy the two problems into a handout for students to work with. Use the overhead projector or a board to work the first problem. Let students work the second problem.

**Teach:**

There are two main trucking options in the motor carrier industry. The first, Truckload, called TL is when the truck hauls an entire truckload. This would be a company like JB Hunt. If you order a truck then you are ordering the whole truck for merchandise. The second option, Less Than Truckload, called LTL, is when the truck picks up multiple shipments from different companies and hauls them in a truck. This would be a company like ArcBest (Arkansas Best). If you ask for shipment on a LTL you are ordering a truck that you will share with multiple companies. TL is less expensive due to not making multiple stops and not needing a terminal to store the goods. The TL goes from one destination straight to another. The LTL is more expensive because it makes multiple stops and usually needs a terminal to unload goods and rearrange them in a truck.

This problem will ask you to determine the cost of shipping both TL and LTL. You will then determine how much money you could save by shipping on a TL instead of a LTL.

Problem:

|  |  |  |
| --- | --- | --- |
| Customer Location | Shipment Weight | LTL Rate |
| Location 1 | 10,000 lbs. | $7.00 |
| Location 2 | 5,000 lbs. | $8.00 |
| Location 3 | 2,000 lbs. | $10.00 |
| Location 4 | 9,000 lbs. | $5.00 |
| Total | 26,000 lbs. |  |

Truck Load Rate: $3.00

Handling cost to create one shipment on a Truck Load: $2.00

Local Delivery Rate: $1.00

Answer:

LTL Rate:

10,000 X $7.00 = $70,000

5,000 X $8.00 = $40,000

2,000 X $10.00 = $20,000

9,000 X $5.00 = $45,000

Total: $175,000

TL Rate:

26,000 X $3.00 = $78,000

26,000 X $2.00 = $52,000

26,000 X 1.00 = $26,000

Total: $156,000

Difference between LTL and TL Rate = Savings of using TL

$175,000 - $156,000 = $19,000

Problem 2:

|  |  |  |
| --- | --- | --- |
| Customer Location | Shipment Weight | LTL Rate |
| Location 1 | 7,000 lbs. | $5.00 |
| Location 2 | 8,000 lbs. | $9.00 |
| Location 3 | 3,000 lbs. | $8.00 |
| Location 4 | 5,000 lbs. | $6.00 |
| Total | 23,000 lbs. |  |

Truck Load Rate: $2.00

Handling cost to create one shipment on a Truck Load: $1.00

Local Delivery Rate: $1.50

Answer:

LTL Rate:

7,000 X $5.00 = $35,000

8,000 X $9,00 = $72,000

3,000 X $8.00 = $24,000

5,000 X $6.00 = $30,000

Total: $161,000

TL Rate:

23,000 X $2.00 = $46,000

23,000 X $1.00 = $23,000

23,000 X $1.50 = $34.500

Total: $103,500

Difference between LTL and TL Rate = Savings of using TL

$161,000 - $103,500 = $57,500