

Lesson Eight: Are Fuel Efficient Cars Destroying Our Roads?

Overview:

This one-day lesson taps into the infrastructure of transportation in an attempt to address the growing funding crisis of roads given falling gas tax revenues in light of fuel efficient hybrids and electric vehicles. Students will explore the economic concepts of public goods and externalities in the context of competing desires for both well maintained transportation infrastructure and encouraging environmental protection and stewardship. Students will explore different funding options and both the benefits and drawbacks of each method. The lesson is designed to take roughly 50-60 minutes, though can be extended through in class research looking into actual legislation that has passed or is currently being considered to address this issue as multiple states are grappling with this changing transportation paradigm.

Objectives: Students should be able to do the following at the end of the lesson:

1. Define key terms: transportation infrastructure, public goods, externalities
2. Explain the current methods for funding transportation infrastructure and the reason why that method is unsustainable in light of technological improvements in fuel efficiency.
3. Brainstorm and justify using economics alternative funding for the future of transportation.

Activities:

1. Opening discussion question.
2. Read handout about road maintenance funding crisis and the definitions of public goods and externalities.
3. Pair discussion surrounding brainstorming options for funding.
4. Go over answers as a class and analyze the pros/cons of each funding option.
5. Role play showing perspectives of each group affected by road funding discussions.
6. After completing the role-play activity, research the actual legislation surrounding road funding in the local state, region or city in which the students live.

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Part 1: Opening Discussion (3-5 minutes)

The lesson begins with an opening question, which can be written on the board or projected. Students can discuss in pairs:

“How did you come to school today? Now, Imagine that there were no roads, why might this be a problem? Who might be hurt by this lack of roads?”

Answers to the first question could include obviously walk, bike, car, bus, subway, or train depending on location of your school and for each student. However, each student will use some form a transportation infrastructure even if just a sidewalk. The purpose of this question is get students imagining a world without adequate roads and to brainstorm issues that would arise (safety, traffic, cost of wear on cars, time lost, businesses hurt, etc.). Encourage students to think about whether roads benefit only drivers or whether they benefit non-drivers too, as this might inform a later discussion about how who should pay for roads. This discussion should only last a few minutes and should simply get the students to understand the need for high quality roads.

Part 2: Introductory Reading (5-10 minutes)

The lesson continues with an introduction, definition, and explanation of transportation infrastructure in the context of public goods and externalities.

First, pass out the “Crumbling Roads” handout. Have students read the introduction section aloud. Reading options include going around the room, popcorn reading (where a student reads and then chooses the next reader), etc. Pause after reading the definition of Public Goods. Ensure that all students are clear on the definition. You can check for understanding by asking students to brainstorm other example of public goods (like national defense or the criminal justice system, two services which we all can enjoy at the same time and which are impossible to exclude non-payers from consuming.)

Continue reading and then again pause after the definition of externalities. Be sure that all students understand the concept of externalities as it is central to the discussion and issues of the lesson. Again check for understanding by asking for other examples of goods with negative externalities (like alcohol since drunk drivers kill non-consumers of alcohol or traffic from sports stadiums near your house) and positive externalities (like the Bellagio fountain entertaining people passing on the street, sports stadiums boosting business at local bars on game days, or security companies helping to catch thieves making everyone safer).

Then, finish the reading including the central question of the lesson. Be sure that all students understand the basic question and the potential trade-off between funding roads and encouraging fuel efficiency and environmentally friendly cars.

Part 3: Examining Possible Funding Options (10-15 minutes)

In part 3, students will explore possible funding options for roads. At first, we want students to maintain an open mind and simply write down every possibility they can think of. There are several possible answers including the example of simply an ever-higher gas tax. These include (but are not limited to):

- A vehicle registration fee
- Using general tax revenue (like income or sales taxes)
- Property taxes so locals pay for local roads
- Charge tolls at each on/off ramp.
- Sell off the roads to private companies
- Donations and voluntary payments (note: this should be shown as unlikely to work due to public goods issue)
- Do nothing and simply allow the roads to crumble or get rid of less needed roads
- Encourage and subsidize more public transportation and alternatives to roads like trains or subways to lower road usage and reduce maintenance needs.

Note: students may come up with other options and you may suggest some of the options above if the students do not think of these.

After sharing answers, have students analyze each option using the 5 questions in the handout. Students should be balancing moral and ethical issues of fairness, realistic feasibility, externalities and social costs/benefits, etc. This can be done in pairs or groups, and it is possible to have each pair/group rank the options from greatest to least preferable on the basis of these metrics. These answers can then be used in the subsequent role play.

Part 4: Role Play (15-20 minutes)

In part 4, students will conduct a role-play activity in which they simulate different real life groups lobbying the government for desired legislation. The purpose of this activity is to bring together all the information from the definitions of public goods and externalities to the different funding options and the pros and cons of each.

Read the scenario out loud and then follow the instruction to break the class up into the groups listed on the handout.

After creating the groups, be sure that each group has selected one or two representatives to speak for that group at the public hearing. Depending on the size of your classroom, you can choose more than two representatives to give more students an active speaking role. Also, read out the key questions that each group will need to address. Give them a minute or two to ask questions of clarification to make sure each group understands exactly who they are, their motivations, and the meaning of the questions that they must answer. Also ensure that they understand that their group's conclusions will be presented in the form of a lobbying argument by the representatives, so note-taking is highly encouraged.

1. Allow students 5-10 minutes in their group to answer the questions listed on the handout. Be sure they reference the funding option and analyses from earlier in the lesson.
2. After completing the discussion, give each group 1-2 minutes to lay out their argument for the option that they chose.
3. After all groups have spoken, give the government 2-3 minutes to discuss the arguments and decide what taxes, fees, etc., should be passed. Encourage thinking outside the box (Can you have a mix of taxes and fees? Can you think of a way to cut costs instead of increase revenues while maintaining high quality roads?) Make sure students feel that all options are available.
4. After the government has passed whatever laws it decides, be sure to ask why the government decided to pass those laws.
5. Lastly, take a poll of the whole class to see which option the class thinks is the best and why.

By the end of the activity, students should have a strong grasp of the different groups involved in lobbying for road maintenance legislation as well as the importance of solving this pressing issue.

Part 5: Follow Up Assignment (in class or homework)

After the lesson is completed, a homework assignment is provided to reinforce the material and connect it to the students' own world. It is also designed to take no more than 20-30 minutes, though it does require internet research. It is possible to do this research in class for a longer class period or to go over the homework as a review in the subsequent class period.

***Note:** The most common responses seem to be an even greater increase in gas taxes as well as a vehicle registration fee for all cars including hybrids and electrics. However, these are not the only two options as different agencies are considering property taxes, increased tolls, borrowing, and several other options.*

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VS.



Introduction: Roads and highways are the backbone of America. They opened the country to westward expansion, and today people use roads to commute to work, transport goods to market, connect families, get exercise by biking or walking, and countless other purposes. Without adequate roads, our economy would struggle as commute times would explode, and the quality of our lives would decline. We currently ship 11.7 billion tons of goods on our nation's highways each year and the Department of Transportation estimates that Americans drive roughly 3 trillion miles each year. That's enough to circle the Earth over 300,000 times EVERY DAY! Clearly, our roads are a key component of our **transportation infrastructure**: the system of roads, bridges, trains, subways, airports, seaports and other transportation vehicles used to move people and goods throughout the country and the world quickly, cheaply, and as efficiently as possible.

Generally, roads tend to be built and operated by a variety of national, state, regional, and local governmental agencies. This is largely because roads are usually considered **public goods**.

Definition of Public Goods: A good that is both consumable by many people at the same time (non-rival) and impossible to exclude from consumption if a person does not pay [non-excludable]. Examples would be AM/FM radio or a large fireworks show as all people can listen or watch at the same time, and it is not possible to stop someone from tuning in or watching if they do not pay.

***Note:** Public goods tend to be provided by the government and funded through some form of taxation because profiting from public goods is extremely difficult as charging users is nearly impossible.*

Traditionally, roads tend to be funded by placing a tax on gasoline because that was an indirect way of charging drivers for the use of the roads as all cars required gasoline. It also served the purpose of making gasoline more expensive to encourage fuel efficiency which is better for the environment. This meant that the consumption of gasoline involves an **externality**.

Definition of Externality: A side effect or consequence of an industrial or commercial activity that affects other parties (i.e.: Not the buyer nor the seller) without this being reflected in the cost of the goods or services involved. These effects can be negative inflicting a cost to society (like pollution from cars) or positive representing a benefit to society (like vaccines lowering the risk of sickness to all those surrounding the vaccinated individual).

***Note:** We tend to place taxes of goods that exhibit negative externalities [like cigarette taxes] and subsidies of goods that exhibit positive externalities [like free flu shots or public schools].*

However, in recent years, with the rise of hybrids and electric vehicles, Americans are driving more and more miles, but often using fewer gallons of gasoline to do it. As a result, Gas taxes have not kept up with the necessary expansion and upkeep of the road network, leading to large budget shortfalls in transportation agencies across the country. In 2014, California alone was said to face a deficit of nearly \$6 Billion leading to unsafe crumbling roads and bridges and a transportation crisis and ticking time bomb. Clearly, the status quo is unsustainable and we have to figure out how we are going to fund the roads of the future with ever-evolving technology.

The central question for today will explore road funding, public goods, and externalities:

How can governments raise revenue needed to fund road maintenance and construction without disincentivizing fuel efficiency and creating a negative externality?

Discuss in Pairs: What might be some of the options for governments to raise money for roads? (try to think of 3)

Example: They could simply raise gas taxes even more.

1.

2.

3.

Now that you have brainstormed some options for funding roads, analyze each of the choices by answering the following questions:

1. What is the most fair way for funding roads? In other words, who should be the main payers for the roads? Users of the roads? The general public? Local residents?
2. Will the funding option be sustainable well into the future given the trend toward more and more fuel efficient cars and electric vehicles?
3. Will it be possible in real life to enforce the tax, fee, toll, etc that your option requires?
4. What effect will your option have in terms of externalities? In other words, will your option incentivize positive or negative behavior?
5. Who would like your option? Who would not like your option? How might that relate to your answer in the previous questions?

Now that we have discussed the issues surrounding funding road construction and maintenance from a variety of angles, it's time to put our knowledge to good use and figure out what to do.

Role Play Activity

Situation: Your state is facing a severe budget shortage for road maintenance and construction. Traffic is getting worse and worse and calls are flooding in about potholes which are damaging cars and making certain roads nearly unusable. Companies and residents are thinking of moving away because the transportation infrastructure is so bad.

You will now be divided into several groups as follows:

1. Commuters in the state who own traditional gas cars
2. Commuters in the state who own hybrid and electric cars
3. Residents in the state who rarely, if ever, drive a car
4. Trucking, bus, taxi, and other transportation companies that use the roads
5. Environmental activists throughout the state
6. The state governmental agency in charge of transportation

First, select one or two representative(s) from your group to speak on your behalf. Once you have done this, Answer the following questions for your group (note: government should also complete this exercise as we can assume that the government agencies want votes and public support as well as to do the moral action, so think about the government's motivations as well):

1. Which transportation funding option discussed earlier would you suggest? Why?
2. Which funding option would you *least* like? Why?
3. Which of the groups might you agree with? Disagree with? Why?
4. What arguments can you use to convince the government to go with your option as opposed to a rival? (note: in answering this, consider the ideas of public goods and externalities as well as ideas of fairness, efficiency, feasibility, etc.)

After you have answered the questions above, your representative will have 1-2 minutes to explain your group's perspectives and lobby for what funding option(s) that you want. You can have multiple suggestions as a mix of funding options as well.

Once all groups have spoken, the government will have 2-3 minutes to discuss the arguments and pass whatever taxes, fees, or otherwise that they choose. Note, this is not necessarily 100% one option or 0% another option. The government can choose whatever it wants, but it must justify its ultimate decisions as well.

Follow Up Assignment

This debate over road funding is not just a theoretical discussion. It is going on across the country in various states and cities on a regular basis.

Go online and research the following questions:

Is this discussion is happening in your state, region, country, or city? Is there a funding crisis near you? If so, what is being proposed and how do you feel about it.

1. Is this debate happening (or did it happen) in your state, region, country, or city. Is (Was) there a funding crisis near you?
2. What are some options being proposed? How will those actions potentially affect you today or in the next 5 years?
3. Do you agree with the legislation being proposed? Why or why not?
4. After conducting your research, what would you propose if you were the governmental agency in charge? Why would you propose that funding option?