



Lesson Plans for Teaching Economics with *The Big Bang Theory*

Using examples in the classroom from current and past television shows and movies is becoming increasingly common. Being able to relate ideas back to a popular clip or episode allows the instructor to reach students in ways the traditional lecture cannot. Building on the work of Tierney, Mateer, Smith, Wooten, and Geerling (2016), this paper introduces five lesson plans tied to clips from *The Big Bang Theory* that can be used in high school (9-12) economics courses.

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1. Introduction

You are not your students. They have different experiences, views, interests, and they watch different shows on television. In this article, we suggest using clips from a popular television show to demonstrate economic concepts.

It has long been understood that you must teach students on the ground where their feet are firm. Using existing knowledge, we add new knowledge into the student's stock. As early as the 5th century BCE, it was known that the act of engaging existing knowledge through retrieval and integration of new knowledge was more effective than pure lecture – what we now refer to as Socratic questioning (Paul & Elder, 2007). More recently, cognitive psychologists have formalized this understanding with the concept of scaffolding, where you must build a structure of existing knowledge to hold more complex concepts (Van de Pol, Volman, & Beishuizen, 2010). While 'chalk and talk' is still the dominant form of teaching style within economics (Becker & Watts, 1996), other disciplines have embraced these methods, along with other active learning techniques, to enhance lectures (Sax, Astin, Korn, & Gilmartin, 1999).

In recent years, cognitive load theory (Sweller, 1988) has improved our understanding of the learning process. Mental resources are limited and the instructor has the ability to allocate those resources in effective, but also ineffective endeavors. However, instructors must consider the amount of load they place on students; if it is too great, they may not learn at all. This is where the existing knowledge (scaffolding) becomes key. As the amount of scaffolding increases, the mental resources necessary to integrate the concept into the student's existing framework are reduced. With the load reduced, the instructor can begin to focus the students' resources on processing the course at a deeper level; this has been shown to improve learning (Bransford, Brown, & Cocking, 1999; Bransford & Schwartz, 1999; Entwistle, 2009; Leamson, 1999).

Against this backdrop, we suggest the following lessons from *The Big Bang Theory*. This show is popular, familiar, and an excellent building block to understanding economic concepts. It routinely ranks in the top ten most highly rated broadcasts by Nielsen. Furthermore, the show's ratings are particularly strong amongst the 13-24 age-group demographic. Goffe and Kauper (2014) find that only one third of teachers believe that students learn best from lectures. Watching clips from *The Big Bang Theory* provides an engaging alternative to the lecture format.

Using television and movie clips to enhance lectures is not unique. Leet and Houser (2003) used classic films to enhance the content of their course, while others have used content from more recent movies (Mateer & Li, 2008; Mateer, O'Roark, & Holder, 2016; Mateer & Stephenson, 2011; Mixon, 2010). Numerous authors have used short clips from television shows (Ghent, Grant, & Lesica, 2011; Kuester, Mateer, & Youderian, 2014; Luccasen & Thomas, 2010). Nevertheless, *The Big Bang Theory* has an advantage over these previous works in that it is undoubtedly familiar to your students.

Our students likely know more about the lives of Amy, Howard, Leonard, Penny, and Sheldon than they do about economics. Let's put that knowledge to work. These five lessons are designed to deepen your students' understanding of economic concepts by drawing on their existing knowledge of *The Big Bang Theory*. Table 1 below provides a brief overview of each lesson, the appropriate unit of study for the lesson to be applied, a list of vocabulary covered in the lesson, and the length of the corresponding clip for that particular lesson.

Table 1 – Overview of Lessons Provided

| Lesson | Clip Title | Unit of Study | Vocabulary | Clip Length |
|--------|---|---|--|-------------|
| 1 | Leonard Incentivizes Sheldon | Basic Economic Concepts | Incentive, negative incentive, positive incentive, unintended consequences | 0:32 |
| 2 | Penny Learns a Lesson about the Assembly Line | Factor Markets | Assembly line, human capital, innovation, marginal revenue product, opportunity cost, physical capital, specialization | 1:07 |
| 3 | The Floppy Disk | Economic Growth | Economic growth, living standards, productivity, technology, technological improvements, technological obsolescence | 0:55 |
| 4 | Sheldon's Time is Too Valuable | Basic Economic Concepts | Production possibility curve, opportunity cost, comparative advantage, absolute advantage | 0:49 |
| 5 | Outsourcing a Date | The Nature and Functions of Product Markets | Average total cost, minimum efficient scale | 0:42 |

2. Specific Teaching Opportunities with Bazinganomics

Bazinganomics (Tierney et al., 2016) is a website-project that accompanies the work of *The Economics of Seinfeld* (Ghent et al., 2010) and *The Economics of The Office* (Kuester et al., 2014). The website is designed to provide instructors with clips, explanations, and lesson plans related to economics concepts from television's most watched regularly broadcast show of the 2016 season, CBS's *The Big Bang Theory*.

Bazinganomics.com has over one hundred different clips relating to a wide range of topics in economics. However, Bazinganomics is primarily targeted at college-principles instructors. Because high school instructors must use national standards and are greatly assisted by fully-developed lesson plans, this paper fills this gap by providing five separate lessons; each provides a description, the appropriate unit to introduce the material, the standards that the lesson meets, key terms and concepts covered, advice for teachers both before and after the clip is shown, the link to the clip, and possible ways to extend the discussion. The target of each lesson plan is specific to the grade 9-12 education space and perhaps more specifically focused on Advanced Placement economics courses. For each lesson, we provide the associated standard from the Council for Economic Education's Voluntary National Content Standards in Economics (Siegfried, et al., 2010) and the content area from College Board's Economics guide (College Board, 2012).

A. Lesson 1: Leonard Incentivizes Sheldon

Standards

CEE National Voluntary National Standards in Economics
Standard 2: Decision Making
Standard 4: Incentives

College Board Advanced Placement Topic

Microeconomics I: Basic Economic Concepts
Content Area A) Scarcity, choice, and opportunity cost

Unit

Scarcity, choice, and opportunity cost

Vocabulary

Incentive: Any factor that motivates a decision maker to act or exert effort. Incentives can be positive incentives or negative incentives and can result in unintended consequences.

Positive Incentive: An incentive that encourages action by offering a reward for an action.

Negative Incentive: An incentive that encourages action by threatening a punishment if an action takes place.

Unintended Consequence: An outcome from establishing an incentive that was not the initial intention of the incentive. Spotting unintended consequences before implementing an incentive is a key skill to learn.

Essential Question

How do incentives play a role in motivating people to make decisions?

Learning Objectives

- Identify the difference between positive incentives and negative incentives.
- Identify incentives and unintended consequences, given a real-life situation.

Warm Up

Start by asking students to define the word incentive. At first, this will seem like an easy task: most students have heard the word incentive before, but it can be difficult to define. Once the class has settled on the definition of incentive, have students find a partner and discuss different incentives they have experienced within the past week. These experiences can be in or out of the classroom. Students will wait until after the clip to share their experiences with the class.

Direct Instruction

Show the following clip from *The Big Bang Theory*: <https://goo.gl/n6W21c>

In the clip, Leonard is speaking to a group of potential students who are seeking information about the university. It is then Sheldon's turn to speak about the Theoretical Physics Department. When Leonard introduces Sheldon, Sheldon refuses to give his portion of the talk. He claims that, "It's a waste of time!" and that he, "...might as well explain thermodynamics to a bunch of Labradoodles." To Sheldon, the costs of giving the talk (the time spent) outweigh the benefits. In order to convince Sheldon to speak with the prospective students, Leonard must increase the cost of not talking. Leonard tells Sheldon, "If you don't do this, I won't take you to the comic-book store."

After the clip is shown, the instructor should ask the following discussion questions related directly to the clip:

- Using economics terms, why does Sheldon not want to give his talk?
- What kind of incentive does Leonard use to get Sheldon to change his mind?
- What other ways could Leonard have tried to use to get Sheldon to change his mind? Would these ways work just as well? Why or why not?
- Can you see any unintended consequences that may pop up in the future because of this interaction?

Incentives and decision-making are arguably two of the most important topics in economics. These themes continue to pop up throughout any level of economics course, from how prices provide incentives to buyers and sellers to how the government influences decision making through policy. Getting students to understand both positive and negative incentives as well as how those incentives affect decision-making will not only prepare them for future economic lessons, but also make them better prepared for the world outside of school.

Guided Practice

The instructor can extend the discussion by using a familiar real-world policy that deal with incentives and unintended consequences: wearing a seatbelt.

Every state (except New Hampshire) has adult seatbelt laws where the driver receives a ticket if he or she is not wearing the belt. This is a great example of a negative incentive. Studies have shown that mandatory-seatbelt laws reduced traffic fatalities by 8 percent and serious traffic-related injury by 9 percent (Carpenter & Stehr, 2008). However, many people still discuss the unintended consequences related to seatbelt laws such as increased reckless driving and more speeding.

The instructor can ask the students to write down other ways in which policy makers could incentivize seatbelt wearing and discuss why it is important to have these types of conversations when coming up with new laws. Getting students to understand incentives and their roles early on in the course will lead to better policy discussions throughout.

Independent Practice

The instructor should have each student pair up with someone different than the beginning of class and think of other incentives specifically related to policy. The students should come up with more concrete examples of policies and their unintended consequences.

Cool Down

As a final review for the class, the instructor should revisit the incentives the students wrote down before the lesson and during the independence practice. Have the students discuss how the lesson changed their approach to thinking about incentives and unintended consequences. Ask the students to determine which were negative incentives and which were positive incentives. As a final task, discuss the role of any unintended consequences that came up when talking about these incentives.

Assessment

The following questions can be used at the end of class:

1. In an attempt to reduce fatalities and increase helmet use, more than 20 states have adopted laws that require children to wear a helmet when riding a bicycle. Research shows these laws also reduced the amount of time children spend riding bicycles. This result of reduced riding time for children is an example of a(n) (correct answer emphasized):
 - a. opportunity cost.
 - b. *unintended consequence.*
 - c. positive incentive.
 - d. negative incentive.
2. Some parents design a sticker chart for their young children that keeps track of all the chores completed in the week. If the chart fills up, they reward the children with their full allowance for the week. This would be an example of a(n) (correct answer emphasized):
 - a. opportunity cost.
 - b. unintended consequence.
 - c. *positive incentive.*
 - d. negative incentive.

Tools for teaching incentives at different grade levels from EconEdLink.org

- [Classroom Cash Incentive Plan](#) (9-12)

B. Lesson 2: Penny Learns a Lesson about the Assembly Line

Standards

CEE Voluntary National Standards in Economics
Standard 6: Specialization
Standard 13: Income
Standard 14: Entrepreneurship

College Board Advanced Placement Topics

Microeconomics III: Factor Markets

Content Area B) Marginal revenue product

Content Area C) Hiring decisions in the markets for labor and capital

Units

Labor, Marginal Revenue Product

Vocabulary

Assembly line: A process where laborers specialize in specific tasks using significant capital in order to lower the per-unit cost of production.

Human Capital: The expertise that labor uses in the production process.

Innovation: The process of producing or providing new goods and services.

Marginal Revenue Product (MRP): The additional revenue generated by the extra output from employing one more unit of a factor of production.

Opportunity Cost: The next best option the person is giving up. In the context of a PPC, this is how much of the other product the agent is giving up by producing one more of the chosen product.

Physical Capital: The equipment, land, technology and buildings that labor utilizes in the production process.

Specialization: The skills developed by workers that allow them to perform tasks more efficiently.

Essential Question

Why do some laborers earn more than others?

Learning Objectives

- Define physical capital, human capital, specialization, marginal revenue product, and assembly line.
- Explain the difference between human and physical capital.
- Explain the advantages of using an assembly line and specialization in the production process.

Warm Up

Start the class by asking the question "Have you ever made something that others wanted to buy?" If so, were you successful? Explain. If not, have you ever had an idea for an invention? How would you go about trying to make something for the first time? Once you had developed a prototype, what could you do to make more of the prototype at a lower cost?

Direct Instruction

Show the following clip from *The Big Bang Theory*: <https://goo.gl/JRbE7C>

Understanding the production process can be one of the most challenging microeconomic topics. The clip you are about to watch will help your students understand the transition from a startup enterprise to a viable business. Because many students do not have experience managing your own business, this scene helps to visualize the process.

In the clip, Penny decides to make flower barrettes in her spare time to supplement her pay as a waitress. Because Penny is not very good at math, she decides to seek Sheldon's advice in order to earn more money. Sheldon explains to Penny that if "she took advantage of modern marketing techniques and optimized [her] manufacturing process [she] might make this a viable business." Sheldon begins timing how long it takes Penny to make a flower barrette. It takes her 12 minutes and 17 seconds and Penny seems quite happy until Sheldon says "that's 4.9 Penny Blossoms per hour. Based on your cost of materials and your wholesale selling price, you'll effectively be paying yourself \$5.19 a day. There are children in a sneaker factory in Indonesia who out-earn you." To increase Penny's productivity, Sheldon suggests that they create an assembly line to lower the cost of manufacturing. They begin working together to make Penny Blossoms, even singing a rhythmic work song to increase their productivity. Together they produce a single Penny Blossom in less than 3 minutes!

Guided Practice

Discuss student thoughts on the clip and transition into a lesson on specialization and increased productivity. After showing the clip, posit the follow scenario to the class:

Why did Penny only earn \$5.19 a day?

Solicit student opinions/answers. Answer: Penny is making each barrette entirely by herself. This means that she cannot specialize in a single task related to production. As a result, she is not very fast at making the barrettes (her productivity is low). She'd benefit from setting up an assembly line where she hires workers to each complete an individual step in the production process so that each barrette is made more quickly.

Independent Practice

Ask the students to partner with a neighbor and consider the following problems:

- What solution did Sheldon propose to help Penny earn more money?
- How fast was Penny able to make a Penny Blossom once specialization was tried?

The instructor should guide students toward the correct solutions. For students where this isn't immediately apparent, they should note that Penny was trying to complete the entire production process by herself, without any help or ability to specialize.

Cool Down

This sets up the instructor to tackle a common misconception about sweatshop labor. Ask the students why the United States doesn't manufacture many goods, instead choosing to import them. Initially, the students will say we import because we are bad at manufacturing. By telling them that we are in fact one of the most productive manufacturing countries in the world they will have to consider other options. Eventually the

discussion will lead to the opportunity cost of producing labor-intensive goods.

Assessment

The following questions can be used at the end of class:

1. Penny works as a waitress, which is a labor-intensive job. What additional physical capital could a restaurant provide wait staff to increase the ability of the staff to serve more customers?

Answer: The restaurant might provide tablets for sit-down customers to use when ordering or provide tablets for waiters to take orders so that the information reaches the kitchen instantaneously.

2. Fast food restaurants rely on low-skill labor to fill many positions. If you were the manager at a fast food restaurant, would you consider installing ordering kiosks?

Answer: You would install kiosks if the cost of the kiosk was low enough to make orders from the kiosk more cost-effective than hiring labor to take the orders.

3. Walmart and Amazon are the nation's two largest retailers. Compare and contrast the process both firms use to provide goods to consumers.

Answer: Walmart is best known for its efficiency in moving large quantities of goods from warehouses to stores. Customers must travel to stores and (generally) buy enough while there to offset the travel cost. Amazon also has warehouses, but they send their products directly to the consumer. Consumers save the time it would have taken to go to the physical store and pay shipping charges for the convenience.

Tools for teaching productivity at different grade levels from EconEdLink.org

- [Case Study on Productivity \(1 of 3\): Henry Ford and the Model T](#) (9-12)
- [Lemonade and Cookies](#) (9-12)

C. Lesson 3: The Floppy Disc

Standards

CEE National Voluntary National Standards in Economics; Standard 15: Economic Growth

College Board Advanced Placement Topics

Macroeconomics VI: Economic Growth

Content Area B) Determinants of economic growth (Research and development, and technological progress)

Units

Definition of Economic Growth; Determinants of Economic Growth

Vocabulary

Economic Growth: A sustained rise in a nation's production of goods and services.

Living Standards: The quality of life or level of material prosperity enjoyed by individuals, a specific demographic group, or a geographic region such as a country.

Productivity: The effectiveness of effort as measured in terms of the rate of output per unit of input.

Technology: The knowledge that is available for use in production.

Technological Improvements: The introduction of new techniques or methods so that firms can produce more valuable outputs per unit of input.

Technological Obsolescence: Occurs when a new product has been created to replace an older version.

Essential Question

How does technology contribute to economic growth?

Learning Objectives

1. Define “technology” in economic terms
2. Explain the critical role that technology plays in driving economic growth

Warm Up

Begin by asking students “How do you save data when working on a computer today?” Most will answer that they save data on a USB drive or to the Cloud. Now, ask your students, “Did these mediums always exist? No. What did your parents use?” Some students will know that disks of some variety existed in the past. Pull up a picture of a floppy disk! “Could you imagine using a floppy disc to save data, or back up your files? How much storage space do you think a floppy disk had?” The standard 5.25-inch disk had a capacity of 1.44MB. You would need 711 disks to download 1 gigabyte of data.

Direct Instructions

Show the following clip from *The Big Bang Theory*: <https://goo.gl/Pm2aGz>

Sheldon is discussing his list of mortal enemies, which he keeps on a 5.25-inch floppy disc. When Amy asks the obvious question – why his list is saved on a floppy disc – Sheldon explains to her that the list was started when he was 9 years old (in 1989). Although Sheldon holds a PhD in Physics and works as a theoretical physicist at Caltech, it has never occurred to him to bring his magnetic storage medium into the 21st century. He is using technologically obsolete equipment. Not surprisingly, the disc fails to work.

Guided Practice

Discuss student thoughts on the clip and transition into a lesson on technology and economic growth. After showing the clip, present the following question to the class:

How has advancement in computer technology contributed to economic growth?

Most students may not understand that technology is a key driver of economic growth: the idea of making more with less, increasing efficiency and expanding production possibilities. The above clip tackles the problem from the other direction. Sheldon willingly uses a storage medium that he knows is technologically obsolete. In this case, his refusal to update his storage preferences acts as an impediment to economic growth. Sheldon can't update his list of mortal enemies to include his boyhood idol: Wil Wheaton.

Independent Practice

Ask students to partner up with a neighbor and consider the following questions:

1. What are some examples of technological obsolescence that obstruct economic growth?
2. If Sheldon were to update his mortal list of enemies in 2030, what storage mediums would be available?

Cool Down

This clip shows how technology can both advance – and obstruct – economic growth. As a final review for this class, connect the discussion of productivity, output, and living standards to explain why certain countries have prospered and grown rich while others have stagnated and remained poor.

Assessment

The following questions can be used at the end of class:

1. Why is technological advancement important for economic growth? (correct answer emphasized)
 - a. It increases leisure time.
 - b. It increases prices, helping producers.
 - c. *It allows us to produce more output while using fewer resources.*
 - d. It allows us to sustain a population while consuming fewer goods and services.

Answer: When we can make more output with less capital, labor, and land, growth occurs and quality of life improves. In addition, inputs can go on to produce other goods that we never produced before because fewer inputs are now needed to produce.

2. How does a good education system contribute to technological advances and therefore economic growth?

Answer: Education plays a large role in technological advances. A good education system will increase the number of engineers, scientists, inventors, and other skilled workers. Technological advances generated by these workers will increase the productivity of physical capital, leading to an increase in growth.

3. In “Welcome to the Future,” Brad Paisley¹ sings about the advancements in technology that have improved our everyday lives over the past several decades. Based on your viewing of the video, how does technological progress make us better off? Provide at least two examples given in the music video.

Answer: From something as advanced as the improvement in communication between international companies to something as insignificant as having Pac-Man on your cell phone, “every day is a revolution,” according to Paisley.

1 <https://www.youtube.com/watch?v=Y0Yg9wjctRw>

Tools for teaching productivity at different grade levels from EconEdLink.org

- [Case Study on Productivity: Henry Ford and the Model T \(Part 1\)](#) (6-8, 9-12)
- [Transportation: They Say We Had a Revolution \(Part 1\)](#) (6-8, 9-12)
- [Transportation: They Say We Had a Revolution \(Part 3\)](#) (6-8, 9-12)

D. Lesson 4: Sheldon's Time is Too Valuable

Standards

CEE Voluntary National Standards in Economics
Standard 1: Scarcity
Standard 5: Trade
Standard 6: Specialization

College Board Advanced Placement Topics

Microeconomics I: Basic Economic Concepts
Content Area B) Production possibilities curve
Content Area C) Comparative advantage, absolute advantage, specialization, and trade

Advanced Placement Topic

Basic Economic Concepts

Units

Decision Making, Trade

Vocabulary

Production Possibility Curve (PPC): This economic model describes the possible production choices given two production outputs and some resource constraint. In this lesson, the resource constraint is time itself.

Opportunity Cost: The next best option the person is giving up. In the context of a PPC, this is how much of the other product the agent is giving up by producing one more of the chosen product.

Comparative Advantage: When the opportunity cost of producing the product (in units of the other product) is less than another producer.

Absolute Advantage: The ability to produce more than another producer, given the same units of the input resource (e.g. time).

Essential Question

What is a production possibility curve and what does it tell us about comparative and absolute advantage?

Learning Objectives

- Draw a linear two-good production possibility curve.
- Determine the opportunity cost from a two-good production possibility curve.
- Identify which agent has a comparative and absolute advantage using an opportunity cost table.

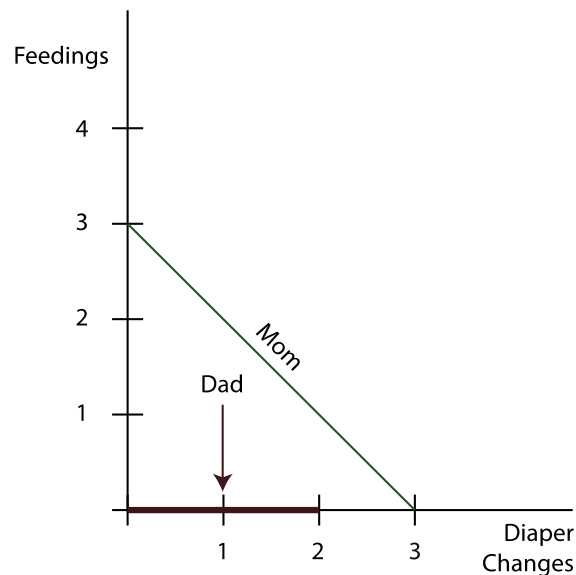
Warm Up

Start the class by asking the question “Why do men change the diapers and women do the breast feeding?²” Most students will be confused or indicate that the question doesn’t make sense because men can’t breast feed. Explore with the class the cost of the man breast feeding; usually, this will result in a consensus that the man incurs no cost to breast feed because they cannot breast feed.

Direct Instruction

Tell the class you have a tool that can explain this question and show that their answer is wrong: the production possibility curve (PPC). Ask the class to consider a world where the only two goods that mom and dad can produce in a given day are diaper changes and feedings. Allow the students to select numbers for the maximum number of diaper changes or feedings per day for mom and the maximum number of diaper changes for dad. The resulting figure should look similar to Figure 1.

Figure 1 – Production Possibilities Curve for Parents Splitting the Work



² The ‘breast-feeding/diaper-change’ example is known by some in the economics teaching community. However, to the authors’ knowledge, it has never been previously documented.

The resulting PPC recognizes that it is infinitely costly (in units of diaper changes) for the man to breast feed, therefore even if a particular woman happens to be a faster diaper changer, the man should still change the diapers. This is a particularly good example to introduce opportunity cost tables (Figure 2). It is easy to see that there is a one-to-one trade-off for mom, while dad is either giving up zero or an infinite number of units of the other good.

Figure 2 – Opportunity Costs and Determining Comparative Advantage

| | Dad | | Mom |
|-----------------|-------------------------|---|------------------------|
| 1 diaper change | <u>0 feedings</u> | < | 1 feeding |
| 1 feeding | Infinite diaper changes | > | <u>1 diaper change</u> |

The instructor should explicitly connect the values in Figure 2 to the slopes in Figure 1 (-1 and 0). In the experience of the authors, this is also the best time to define comparative and absolute advantage.

Guided Practice

Show the following clip from *The Big Bang Theory*: <https://goo.gl/qajxs3>

In this clip, Sheldon is required by the university administrators to take a sexual harassment course due to inappropriate behavior towards his assistant. However, as he explains to his assistant: "My time is much too valuable to waste on nonsense like this, so I'm going to need you to take it for me."

After showing the clip, posit the follow scenario to the class:

Suppose it takes Sheldon four hours to complete the sexual harassment course, but it would take his assistant twelve hours. In a twelve-hour period, Sheldon could do two units of other work. Sheldon doesn't value his assistant's work very highly; he only thinks she does 1/2 a unit of work in a twelve-hour period.

Be careful to indicate this is how Sheldon sees the world, not necessarily how the world actually is. It may be that his assistant is actually better at the sexual harassment course, and her other work is certainly more valuable, but Sheldon thinks quite highly of himself and puts little value on her work or her abilities in general.

One should plot the two PPCs, as seen in Figure 3. Make a point (if Sheldon's view of the world is correct) that despite Sheldon having an absolute advantage in both tasks, it will be less costly for his assistant to complete the sexual harassment course.

Using the two PPC slopes (-3/2 and -2), we can create the table in Figure 4. The reason that it is better for his assistant to complete the sexual harassment course is because it is less costly.

Figure 3 – Sheldon’s View of His and His Assistant’s PPCs

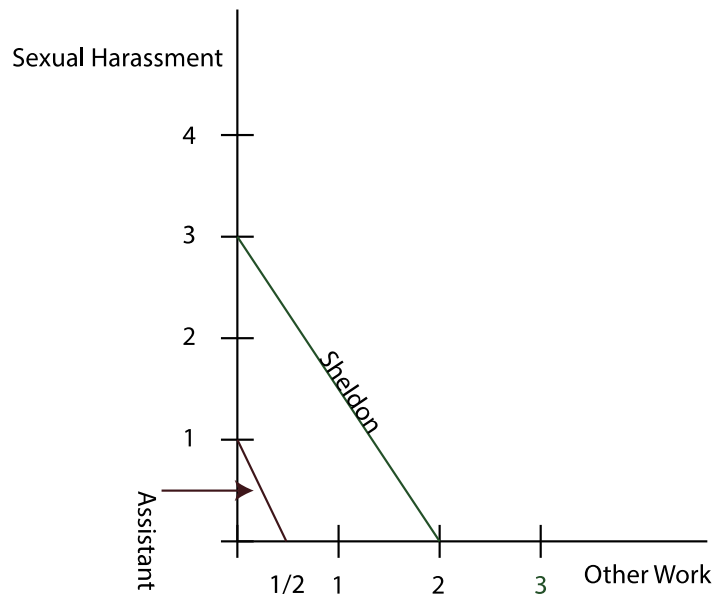


Figure 4 – Opportunity Costs and Determining Comparative Advantage in *TBBT*

| | Assistant | Sheldon |
|----------------------------|-----------------------------|--------------------------------------|
| 1 sexual harassment course | <u>1/2 unit other work</u> | 2/3 unit other work |
| 1 unit of other work | 2 sexual harassment courses | <u>3/2 sexual harassment courses</u> |

Independent Practice

Ask the students to partner with a neighbor and consider the following problem:

Suppose you and your idiot brother are in business together making Penny Blossoms. You can sell three units every hour and he can only sell one unit every hour. However, you can produce three units every hour and your brother can only produce half a unit per hour. Who has the comparative advantage in sales?

The instructor should guide students toward the correct solution ('your brother'). For students for whom this isn't immediately apparent, they should calculate the opportunity cost table that indicates there is a one-to-one trade-off for 'you' but a two-to-one trade-off for 'your brother.' In essence, 'your brother' is so bad at production it costs him (in terms of opportunity cost) comparatively little to sell.

Cool Down

This sets up the instructor to tackle a common misconception about international trade. Ask the students why the United States doesn't manufacture many goods, instead choosing to import them. Initially, the students will say we import because we are bad at manufacturing. By telling them that we are in fact one of the most productive manufacturing countries in the world they will have to consider other options. Eventually the discussion will lead to the opportunity cost of producing labor-intensive goods.

Assessment

The following questions can be used at the end of class:

1. The United States and Brazil trade commercial airplanes. Assume there are only two types of aircraft: wide-body and narrow-body aircraft. The United States produces wide-body aircraft and imports narrow-body aircraft. Brazil produces narrow-body aircraft and imports wide-body aircraft. From this information which of the following must be true (correct answer emphasized)?
 - a. The United States has an absolute advantage in wide-body aircraft and Brazil has an absolute advantage in narrow-body aircraft.
 - b. *The United States has a comparative advantage in wide-body aircraft and Brazil has a comparative advantage in narrow-body aircraft.*
 - c. The United States has a comparative advantage in both wide-body and narrow-body aircraft.
 - d. Brazil can produce narrow-body aircraft with fewer inputs than the United States, while the United States can produce wide-body aircraft with fewer inputs than Brazil.
2. Assume a lawyer (Jane) and her paralegal (Jeff) are trying to allocate their time between typing and legal briefs. Jane can type 100 words a minute or write three legal briefs per hour. Jeff can type 50 words a minute or write one legal brief per hour. Who has the absolute advantage in each type of production (correct answer emphasized)?
 - a. *Jane has the absolute advantage in both forms of production.*
 - b. Jane has the absolute advantage in legal briefs while Jeff has the absolute advantage in typing.
 - c. Jeff has the absolute advantage in legal briefs while Jane has the absolute advantage in typing.
 - d. Jane has both the absolute and comparative advantage in typing. Jeff has an absolute advantage in legal briefs.
3. You run a part-time landscaping service specializing in lawn mowing and leaf clearing. In an afternoon, you can cut two lawns or clear three driveways of leaves. What is the opportunity cost of one cut lawn (correct answer emphasized)?
 - a. Three driveways cleared
 - b. Two-thirds (2/3) of a driveway cleared

- c. Three-halves (3/2) driveways cleared
- d. Half (1/2) of the afternoon

Tools for teaching tradoffs at different grade levels from EconEdLink.org

- [Using Slope to Compute Opportunity Cost](#) (9-12)
- [Should LeBron James Mow His Own Lawn?](#) (9-12)
- [Frontier Specialists](#) (9-12)

E. Lesson 5: Outsourcing a Date

Standards

CEE Voluntary National Standards in Economics
Standard 2: Decision Making

College Board Advanced Placement Topics

Microeconomics II: The Nature and Functions of Product Markets
Content Area C) Production and Costs

Unit

Production and Costs

Vocabulary

Average total cost (ATC): The total cost of production divided by the number of units produced. This curve is U-shaped and is the sum of the average-variable cost and average-fixed cost curves. The firm operates at a specific point on this curve based on how many units they produce. This operating point might not be the minimum of the curve.

Minimum efficient scale (MES): The minimum quantity the firm can produce at the lowest possible average total cost. The MES can be found graphically as the first point (lowest quantity) on the long run average total cost curve that minimizes average total cost.

Essential Question

How does altering the number of units produced change the per-unit cost of production?

Learning Objectives

- Identify the difference between movements along the cost curves and changes in the curves
- Given information on the production process and costs, identify when purchasing inputs on the open market is cost minimizing

Warm Up

Before showing the clip, ask the class: “Why hasn’t mass transit been successful in Los Angeles (LA)?” Students will suggest that the mass transit system is more expensive in LA³. Assuming that you have already introduced the idea of cost curves (which the authors suggest), you can ask the students to draw the mass transit cost curves for LA and New York. Most students will suggest the curves are different with a higher minimum average-total cost for LA.

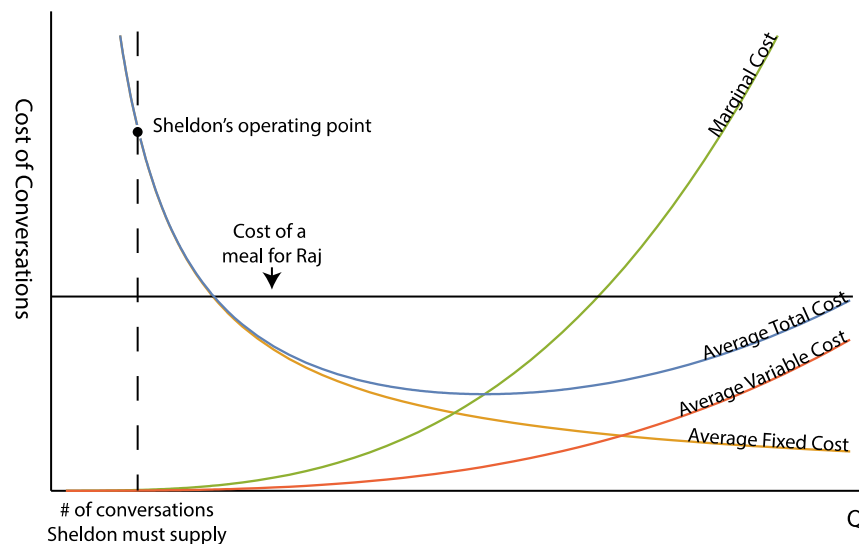
Direct Instruction

Show the following clip from *The Big Bang Theory*: <https://goo.gl/ixGdKq>

In the clip, Sheldon wants Raj to come on his date with Amy. Sheldon explains that he has a contractual obligation to supply Amy with conversation during the date, but he can outsource that task to someone else.

After the clip is shown, the instructor should draw the average total cost curve and discuss where on that curve Sheldon is operating (Figure 5). Point out that, if we all viewed the world the way Sheldon does, we would all bring ‘a Raj’ to supply the minimum number of conversations.

Figure 5 – “Conversation” Cost Curves



3 While many members of the general public know that public transit in LA has been a struggle, depending on the geographic location of the students their might be better examples of a failed transit systems. For instance, Cleveland’s transit system could be substituted for LA’s in the Midwest.

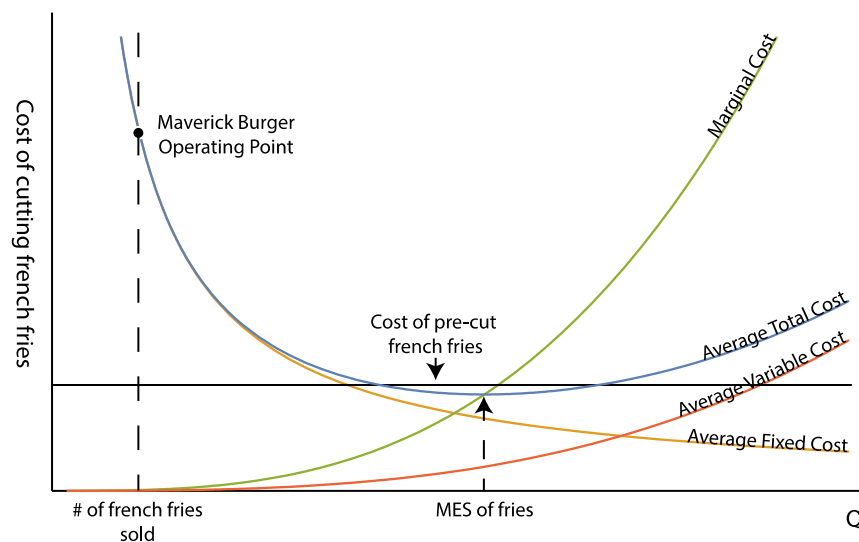
This is a classic example of how using a supplier often reduces overall cost if we use only a few units of the input. Sheldon supplies a good ('boyfriend') that has a set of characteristics (inputs) such as physical contact, affection, and conversation that Sheldon can produce or buy. But, Sheldon is bad at casual conversation. In much the same way that it is expensive to setup a new factory, Sheldon would have to go through enormous up-front costs to become a good conversationalist. If Sheldon wished to have many casual conversations, his average-total cost would be low. But Sheldon is only required to supply a small number of conversations; thus his average cost is high. Even assuming that Sheldon has to compensate Raj with a free meal, it is cheaper for Sheldon to bring Raj than to supply the conversation himself.

Guided Practice

The instructor can extend this discussion using a familiar real-world business problem: peeling and cutting potatoes for french fries. The most efficient way to peel and cut potatoes for french fries is a very large automated production plant that uses water to clean, skin, and finally cut potatoes. Many of your students who work in fast food will likely know this. However, those who work at a major chain receive fries from the parent company, while those who work for an independent restaurant buy fries on the market. (While it is helpful that this particular business problem is familiar to those who have worked in fast food, it isn't necessary as it can easily be explained by the instructor.)

Erase the labels on Figure 5 and posit the following question to your students: Suppose you work at 'Maverick Burger' (a single location burger shop) and you are trying to decide if it is better to process your own fries or buy them from a supplier. What labels have to change in Figure 5 to characterize this problem? The resulting figure should look similar to Figure 6.

Figure 6 – French Fry Processing Cost Curves



The instructor can optionally introduce the concept of minimum efficient size. Because this method of fry processing is the most efficient, the minimum of the average-to-total-cost curve (ATC) is the minimum efficient size. Because there are multiple producers of french fries with a small amount of differentiation, the market price for pre-cut fries will be near, but above, the minimum of the ATC. The instructor can call back to this idea when explaining optimal plant size and market structures in later chapters.

Independent Practice

Bring the discussion back to metropolitan transit systems. Ask students to reconsider why transit systems have been less than successful in some regions. The authors suggest allowing the students to work on this problem independently, and then allowing them to work with a peer. The issue facing LA isn't the cost curves themselves but instead the point on the cost curves at which the transit system is operating.

Cool Down

As a final review for the class, connect the discussion of cost curves to the reasons why firms like Apple continue to purchase many of their inputs despite being enormous firms. It is simply cheaper to purchase the parts on the open market.

Assessment

The following questions can be used at the end of class:

1. Harley Davidson builds production facilities based on historic sales. However, in 2009, the demand for their product suddenly dropped due to the Great Recession. This resulted in a decrease in revenue per unit, but a larger decrease in profit per unit. Which answer best explains this result (correct answer emphasized)?
 - a. Due to the decrease in production, fixed costs are no longer spread across as many units. Therefore, the average-total-cost curve shifted up resulting in a smaller profit margin.
 - b. *Due to the decrease in production, the average-total-cost increases due to movement along the average-total-cost curve. This results in a smaller profit margin.*
 - c. Due to the decrease in production, revenue decreased resulting in a decrease in the profit margin. Profit margins are more sensitive to changes in price. Therefore, the profit margin changed by more than the change in revenue.
 - d. Due to the decrease in production, each worker was less productive resulting in an increase in costs. This resulted in a smaller profit margin.
2. The workers at Maverick Burger have formed a union forcing management to uniformly increase wages. This impacts the cost curves in the following way (correct answer emphasized).
 - a. *This results in a shift upward of the marginal, average-variable, and average-total-cost curves. This results in higher costs per unit of production.*
 - b. This results in a movement along the average-total-cost curve to the left. This results in higher cost per unit of production.
 - c. This results in a movement along the average-total-cost curve to the right. This results in higher cost per unit of production.

- d. This results in a shift upward of the average fixed, average-variable, and average-total-cost curves. This results in higher costs per unit of production.
3. Your school's sports governing body has decided to ban all major sports. As a result, your stadium is now only used for dressage: a form of horse dancing. Assume that nearly all stadium costs are fixed and dressage doesn't become popular at your school. What can be said about the per-viewer costs (correct answer emphasized)?
 - a. They will increase as a result of a shift upward in the average-fixed cost and average-total-cost curves.
 - b. They will increase as a result of a movement along the average-total-cost curve to the right.
 - c. *They will increase as a result of a movement along the average-total-cost curve to the left.*
 - d. They will increase as a result of a shift upward of the marginal and average-total-cost curves.

Tools for teaching firm decision making at different grade levels from EconEdLink.org

- [Rates of Change](#) (9-12)
- [Break-Even Analysis](#) (9-12)

3. Conclusion

The five lesson plans included in this paper can be adopted by high school instructors (grades 9-12) to increase the level of engagement in their classrooms. Each plan was built with the knowledge base of the students in mind to maximize the amount of learning from the lesson using the students' existing familiarity with a popular TV show. We encourage teachers to try one or more of the provided lessons to make the economics classroom more engaging and thought provoking.

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