

International Trade and Comparative Advantage

Lesson by

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Lesson description

This lesson will allow you to integrate technology into your classroom in a meaningful way. Students begin their discussion of specialization and trade with an Atlanta Fed [Bell Ringer](#) activity using a trade quote from Dr. Martin Luther King and a competition to identify the top import and export partners for the United States. Students will learn more about scarce resources, production possibilities, comparative advantage, and trade with a free [Socrative](#) activity that utilizes the Atlanta Fed [Trade](#) infographic. This is set up as a competition based on productivity. Finally, students will enter information into another Socrative interactive as they form their own mini-countries, produce a simple good, and form a trading relationship with another student mini-country using comparative advantage calculations. Students will use the [Econlowdown](#) instructor management panel to submit their press release announcing their country's new trade agreement and describing the benefits and challenges the agreement is likely to create for citizens.

Concepts

Economic interdependence	Absolute advantage
International trade	Comparative advantage
Factors of production	Inputs
Production possibilities	Outputs
Export	Terms of trade
Imports	Free trade

Objectives

Students will be able to:

1. Define key terms such as international trade, factors of production, production possibilities, absolute advantage, comparative advantage, and terms of trade.
2. Explain how international trade creates interdependent relationships between countries.
3. Describe how factors of production influence the exports and imports of countries.
4. Calculate the opportunity cost of producing one unit of a good in terms of another good.
5. Create a trade agreement between two "countries" based on comparative advantage and terms of trade.
6. Describe the benefits and costs associated with free trade.

Related content area

Economics



Time required

Two class periods for a 55-minute class, or one class period on a 90-minute block schedule

Materials

[“International Trade” PowerPoint presentation](#)

[International Trade Bell Ringer](#) activity

Atlanta Fed Trade infographic ([digital](#) format or [order](#) five print copies for small groups)

Internet access for teachers and students (for the free [Socrative](#) activity and *Econlowdown* writing assessment)

A timer

[“Trade Infographic Quiz” Excel spreadsheet for Socrative](#) (upload into [Socrative](#))

Handout 1: “Comparative Advantage Simulation”

[“Comparative Advantage Simulation” Excel spreadsheet for Socrative](#) (upload into [Socrative](#))

Handout 2: “RAFT Writing Assessment and Rubric”

[Econlowdown](#) written assessment tool (optional—press release can be written on paper)

Appendix 1: “*Econlowdown* Instructor Management Setup”

Preparation

Bell Ringer: Download the [International Trade Bell Ringer](#) and make copies of *Bell Ringer* Handout 2: “Ranking U.S. Trading Partners” for each of your students. Visuals 1 and 3 found in the *Bell Ringer* are already part of the accompanying “International Trade” PowerPoint slides for this lesson. Read through the instructions for using Visuals 1 and 3 and Handout 2.

Socrative: If you do not already have a teacher account with [Socrative](#), you can register for free or log in with your Google account. After you are registered, you will need to upload the two Excel spreadsheets, “Trade Infographic Quiz” and “Comparative Advantage Simulation,” into Socrative. You can download these spreadsheets by clicking on them in the materials section of this document. Then copy and paste your Socrative “room number” into the PowerPoint on slides 5 and 8. You will launch the “Trade Infographic Quiz” in Step 7 and the “Comparative Advantage Simulation” in Step 13 of the procedures. You will have to “end” each quiz before launching the next one. Reports for each quiz for each class will be saved in your teacher account to view later.

Trade Infographic: The Trade infographic can be accessed by your students in [digital](#) format or you can [order](#) print copies for each group of students.

Econlowdown: Teachers can assign the press release writing assignment for this lesson through the Fed's [Econlowdown](#). This website is a free [instructor management panel](#) that allows teachers to assign courses, videos, and writing assignments to students. You will need to register as an instructor prior to assigning the press release. Registration instructions are found after the lesson procedures in this document. You can easily create classes and upload your students' names from a CSV file created in Excel and print login information for each student. Students do not have to register individually, they just enter the user name and password provided by the instructor. Prior to class, you will create the writing assignment from the trade agreement press release in *Econlowdown* and assign it to your students. If you plan to use the assessment option, assign the comparative advantage course to your students and have them take the pretest the day before you plan to do the lesson.

Assessment option: If you would like to have pre- and posttest data for this lesson, use the [Econlowdown instructor management panel](#) to assign the comparative advantage course to your students. Prior to implementing this lesson, ask students to take the pretest. The data will automatically upload to your teacher portal. After implementing the lesson, have students take the posttest and use the data to plan additional interventions. For students who missed the lesson or need remediation, you can assign the entire comparative advantage online course.

Procedures: Instructions for the *PowerPoint presentation* appear in italics.

1. *Open the International Trade PowerPoint presentation.* You may want explicitly to tell students to put away cell phones and/or classroom devices for steps 1–4 so they cannot look up information on the Internet.
2. *Display slide 1. Review the lesson objectives.*
3. *Display slide 2.* Make sure the attribution for the quote is not displayed. This will show on the next click. Ask students to read the quote and guess who made this statement. Answers will vary, but many students may guess the names of contemporary economists or politicians since many of these relationships hold true today. *Click again to reveal the attribution.* Ask students to respond to this revelation. They will likely express surprise and may want to talk about current events related to trade. Ask them whether they agree or disagree with Dr. King and why. Answers will vary.
4. Tell students they will be learning how these interrelated global trade relationships develop as well as who benefits and who may be hurt by international trade. Divide the class into small groups. Distribute a copy of Handout 2: "Ranking U.S. Trading Partners" found in the [International Trade Bell Ringer](#) to each student or one per small group of students.
5. *Display slide 3.* This slide has the same lists as the handout. If you don't want to make copies of the handout, you can have the group complete their rankings on a piece of paper. Tell the groups to rank each category of U.S. trading partners from 1 being the biggest value partner to 10 being the lowest value trading partner. Tell students they will have five minutes to rank the countries.
6. *Display slide 4.* This slide shows the answers based on first-quarter 2016 data. Tell each group to count up the number of correct ranks they gave and circle these. Celebrate the group with the most correct answers. Ask the students to discuss anything that surprised them. Answers will vary, but many students will have ranked China above Canada in the third column and some may be surprised to see so many European countries on the lists.
7. *Display slide 5.* Tell students they will now compete in groups to answer quiz questions about a trade infographic. Explain that both the number of correct answers and the number of seconds it takes to complete the quiz matter. Now students can get out their cell phones. One group member should navigate to the URL for Socrative found on the slide. Tell the student to enter the room number in the field provided and a group name. (The quiz will not start

until you launch it from your teacher account.) Ask the remaining students in the group to navigate to the trade infographic URL shown on the slide. Ask the groups to answer the quiz questions using the infographic as quickly and accurately as possible. Encourage them not to shout the answers since other groups could overhear answers. Tell them that when their group finishes, you will call out the minutes and seconds it took for them to complete the quiz. Someone in the group should write down the group's time. When all groups are ready, launch the "Trade Infographic Quiz" you uploaded into Socrative. Monitor the progress of the groups and be ready to call out each group's time.

8. *Display slide 6.* When all the groups have finished, they will need two pieces of information to calculate their productivity. Tell students their productivity is measured by their *output* (number of questions answered correctly) divided by their *input* (number of minutes worked to the first decimal point). Tell each group how many questions they got correct and help them calculate the number of minutes to the first decimal point. The example on the slide is calculated by taking the 25 seconds and dividing by 60 seconds (this is the total number of seconds in a minute). Record each group's productivity calculation in the chart and celebrate the group with the highest number. Tell them the highest number is best because it means the group produced the most correct answers per minute.
9. *Display Slide 7.* Distribute Handout 1: "Comparative Advantage Simulation." Tell students that the inputs (resources) available to different countries as well as the outputs (goods and services) the countries can produce with a given set of inputs are important factors in the development of international trade relationships. Tell students they will now begin a simulation to help them learn about an economic model called comparative advantage, which helps to explain why countries trade.
10. Tell students they each have their own independent country now. Ask them to use their first or last name in combination with a country-like suffix such as -land, -topia, and so forth and to write their country name in the blank provided.
11. *Display Slide 7 and click to reveal the "airplane."* Tell students that producing an "airplane" in their country requires them to draw an oval with a triangle attached to the top and another triangle attached to the bottom. Tell them they will have 10 seconds to produce as many airplanes as they can on a blank piece of paper. Give students a moment to get ready. Tell them they must produce one full airplane before mass-producing ovals and triangles. When ready, say "GO!" Call time after 10 seconds. Ask students to count the number of airplanes produced and write the number in the chart on their paper.
12. *Click again to reveal the "car."* Tell students that producing a "car" in their country requires them to draw a rectangle with a square attached in the front and two small circles attached below it. Tell students they will have 10 seconds to produce as many cars as they can on a blank piece of paper. Give students a moment to get a blank piece of paper. Tell them they must produce one full car before mass-producing rectangles, squares, and circles. When ready, say "GO!" Call time after 10 seconds. Ask students to count the number of cars produced and write the number in the chart on their paper.
13. *Launch the Comparative and Absolute Advantage simulation in Socrative. Be sure to select "teacher paced" for this activity. You must also select "show names" and "show answers."*
14. *Display slide 8.* Instruct students to use their classroom WIFI-enabled devices to access the free version of Socrative and tell them to use the information on the slide to sign into your teacher classroom. Tell the students to answer the questions as they appear on their device.
15. Display your teacher view of Socrative on the screen. The first question in the Socrative quiz is, "How many planes did your country produce in 10 seconds?" Tell the students to look at the answers displayed and find the country (or countries if there is a tie) with the highest output. If one country has produced more than all the others, tell

students this country has what is called the “absolute advantage” in producing planes. If many countries have tied for the highest output, tell them that there is not a country with a clear absolute advantage in producing planes.

16. Use your view to advance to the next questions and continue to display your teacher view of Socrative on the screen. The second question is, “How many cars did your country produce in 10 seconds?” Tell the students to look at the answers displayed and find the country (or countries if there is a tie) with the highest output. Ask the students if there is a country with a clear absolute advantage in producing cars. Tell students that absolute advantage can be defined as producing the most output with the same set of inputs, in this case, 10 seconds of time, a writing utensil, and a piece of paper. Tell them they can also define it as producing the same amount of output with less resources. For example, if you told the students to produce a total of 10 planes, you could time them. One student may produce the 10 planes in seven seconds while another student may produce them in 12 seconds. The student who produced 10 planes in seven seconds would have the absolute advantage.
17. Using the teacher version of Socrative, advance to question #3, which tests the students’ knowledge of absolute advantage.
18. Now ask students if countries with an absolute advantage in production can still benefit from trading with other countries that produce less with the same resources. Answers will vary. Some students will say “no” because the country can already do the best. Others may say that it must be true because the United States has more advanced technology than many countries, but it still buys many goods and services from less advanced economies. Tell students that economists use the law of comparative advantage to help countries identify trading relationships that will help both countries increase the amount of goods and services their countries can consume. Explain that trade in the real world is much more complex than the model they will explore in class and economists continue to debate how trade relationships affect countries in the real world.
19. Ask a student volunteer to share their output of planes and cars. Make a table on the board that looks like the example below. Add the student volunteer’s name and outputs in the appropriate column:

Country	Planes	Cars
Narkertopia	10 planes	8 cars

Next, explain that you will use the output from this student to show the class how to find the opportunity cost of producing one unit of each good in this country. Create another table that follows the example below. Tell students that this table shows the output of the country given the same resources. To find the opportunity cost of producing one unit of each good in this country, they will need to create a ratio of the good they are giving up divided by the good they are producing.

Country	Planes	Cars
Narkertopia	$8/10$ or $4/5$ of a car (Read this as when Narkertopia produces a plane, it gives up $4/5$ of a car or the opportunity cost of producing one plane in Narkertopia is $4/5$ of a car)	$10/8$ or $5/4$ of a plane (Read this as when Narkertopia produces a car, it gives up $5/4$ of a plane or the opportunity cost of producing one car in Narkertopia is $5/4$ of a plane)

20. Now ask students to calculate their own opportunity cost for producing one of each good.
21. Advance the Socrative quiz to the next question, "What is the opportunity cost of producing one plane in your country?" Ask students to answer the question and view all the responses from their class. Ask them to write down the names of the countries with a higher opportunity cost in the space provided on their paper. Tell them they will need this information to complete the activity.
22. Now, repeat the same process for question #5 in the Socrative quiz, "What is the opportunity cost of producing one car in your country?"
23. Tell students they will now find a country with which they can trade. Tell them that they want to produce the good for which they have the lowest opportunity cost when compared to the other country. Ask them to find a trading partner and work with the person to complete and answer questions #11 to #16 on Handout 1.
24. When most students have finished these steps, tell them they will now figure out a trade agreement that will benefit both countries. Use the numbers from a volunteer pair of "countries" to do an example on the board. Here is a hypothetical example to follow:

Country	Planes	Cars
Narkertopia	10 planes	8 cars
Henessia	10 planes	10 cars

Country	The opportunity cost for one plane is:	The opportunity cost for one car is:
Country A - Your Country Name: <u> Narkertopia </u>	$8/10$ or $4/5$ of a car(s)	$10/8$ or $5/4$ of a plane
Country B - Your Partner's Country Name: <u> Henessia </u>	$10/10$ or 1 car	$10/10$ or 1 plane

Point out that Narkertopia has the lowest opportunity cost for producing planes and Henessia has the lowest opportunity cost for producing cars. Therefore, Narkertopia should make planes to export to Henessia and should

import cars from Hennessia. Now students need to determine how much of the other country's good they should receive in exchange for one of theirs.

Country	The price of one plane is:	The price of one car is:
Country A - Your Country Name: <u> Narkertopia </u>	0.8 of a car	1.25 plane(s)
Terms of Trade	Select a value that lies between the price of a plane in A and the price of a plane in B: Narkertopia can benefit by trading one plane to Hennessia for 0.9 of a car.	Select a value that lies between the price of a car in A and the price of a car in B: Hennessia can benefit by trading one car to Narkertopia for 1.15 planes.
Country B - Your Partner's Country Name: <u> Hennessia </u>	1 car	1 plane

25. Ask students to complete item #18 on Handout 1.
26. Advance the Socrative quiz and have students submit their answer to question #7 and discuss the results. Tell students that people and businesses in countries throughout the world have to decide in what goods and services they should specialize and with which countries they should trade. Ask students to discuss how they think real trade relationships affect the people and business around the world. Answers will vary, but students are likely to say that people and businesses should be able to consume more than they would if they did not specialize and trade.
27. *Display slide 9.* Tell students they will now use their trade data to complete a short RAFT writing assignment. RAFT stands for role, audience, format, and topic. Distribute Handout 2: "RAFT Writing Assignment and Rubric." Discuss the assignment, the requirements of the piece, and the scoring rubric.
28. If assigning the written piece in *Econlowdown*, *display slide 9.* Distribute the user names and passwords you prepared for your students before class began. Ask students to sign into *Econlowdown* and complete the assignment under Written Assessments. If you are assigning the written piece without using *Econlowdown*, distribute *Handout 2: RAFT Writing Assessment and Rubric.*
29. This concludes the lesson. You can grade the assignments using the rubric. If using online submission, you can score the students electronically and give them a resubmit date if you want them to improve their assignments. If your students need additional practice with this concept, assign the comparative advantage online course available in *Econlowdown.*

Handout 1: Comparative Advantage Simulation

1. Use your name to make a country name: _____ (Examples: Narkertopia, Narkerland, and so on)

2. Produce your products:

	Number Produced Round 1	Number Produced Round 2
Planes		0
Cars	0	

3. Go to <https://b.socrative.com/login/student/> on your device. Enter your classroom number in the field provided: _____. Enter your country name in the next field. (This is important for a later step in the activity.)

4. Participate in the instructor guided questions and discussion using the Socrative tool.

5. Does one country have the absolute advantage over the others in production of **planes**? YES or NO

How do you know? _____

6. Does one country have the absolute advantage over the others in production of **cars**? YES or NO

How do you know? _____

7. What is the opportunity cost of producing **one plane** in your country? _____ car(s)

8. View the class results to question #5. You will use these results to help determine with which “country” you should trade. List all the countries whose opportunity cost for producing **one plane** is higher than yours.

9. What is the opportunity cost of producing **one car** in your country? _____ plane(s)

10. View the class results to question #5. You will use these results to help determine with which “country” you should trade. List all the countries whose opportunity cost for producing **one car** is higher than yours.



Handout 1: Comparative Advantage Simulation (Continued)

- According to the law of comparative advantage, your country should specialize in production of the good for which you have the lowest opportunity cost. Which good, planes or cars, would give you more potential trading partners?
- Go around the room and look for another country you can establish a trading relationship with. Remember, whoever has the lowest opportunity cost for a good should produce that good. Enter each country's opportunity cost in the table below and circle the lowest under good.

Country	The opportunity cost for one plane is:	The opportunity cost for one car is:
Country A: Your Country Name: _____	_____ car(s)	_____ plane(s)
Country B: Your Partner's Country Name: _____	_____ car(s)	_____ plane(s)

- Which country gives up the least to produce planes? _____
- Which country gives up the least to produce cars? _____
- Which country should produce planes? _____
- Which country should produce cars? _____

- Now it is time to find out how good a deal you and your trading partner can arrange. Your opportunity costs can be viewed like a price for the good.

Country	The price of one plane is:	The price of one car is:
Country A: Your Country Name: _____	_____ car(s)	_____ plane(s)
Terms of Trade	Select a value that lies between the price of a plane in A and the price of a plane in B: _____ car(s)	Select a value that lies between the price of a car in A and the price of a car in B: _____ plane(s)
Country B: Your Partner's Country Name: _____	_____ car(s)	_____ plane(s)

- Complete the following using your data:
We have established the following terms of trade between our two countries. The country with the comparative advantage in planes will trade _____ plane(s) to the country with the comparative advantage in cars in exchange for _____ car(s).



Handout 2: RAFT Writing Assessment and Rubric

Role: Trade representative for your simulation country

Audience: The people of your country

Format: Press release

Topic: Announce the new trade agreement negotiated with your trading partner country

Sample Press Release Outline

OFFICE OF THE _(INSERT COUNTRY HERE)_

TRADE REPRESENTATIVE

PRESS RELEASE

New Trade Agreement with _____

(insert date here): Paragraph 1 is a major announcement—announce the country with which you will trade and at least two ways the people of your country will benefit.

In paragraph 2, explain comparative advantage, opportunity cost, and how you determined which country should produce which good.

In paragraph 3, explain the concept of terms of trade, cite your terms of trade information, and explain how this deal allows your country to consume more than it did before the agreement.

In paragraph 4, explain who is likely to be hurt by the agreement, at least two reasons why this may happen, and how your country will help those who suffer because of trade.

Handout 2: RAFT Writing Assessment and Rubric (Continued)

Assessment Item	1	2	3	4
Accuracy of the data	No calculations were included in the piece and/or no interpretation of the calculations are included in the piece.	Calculations were incorrectly calculated and incorrectly interpreted.	The calculations included in the press release were correctly calculated but incorrectly interpreted.	The calculations included in the press release were correctly calculated and their significance was described.
Conceptual understanding	The press release is missing two or more key terms or two or more key terms are incorrectly explained.	One out of the three key terms is missing or explained incorrectly and/or there is no attempt by the student to place the terms into the correct context.	The press release correctly and concisely explains key terms including comparative advantage, opportunity cost, and terms of trade, but does not apply them effectively in the context of the release.	The press release correctly and concisely explains key terms such as comparative advantage, opportunity cost, and terms of trade and uses these terms in context effectively.
Costs and benefits of trade	The costs and benefits associated with the new trade agreement are missing or incorrectly explained.	The press release correctly explains only one cost or one benefit associated with the newly negotiated trade deal or does not explain the costs and benefits within the context of the simulation.	The press release clearly and correctly explains at least one benefit and one cost associated with the newly negotiated trade deal and explains this within the context of the simulation.	The press release clearly and correctly explains at least two benefits and two costs associated with the newly negotiated trade deal and explains this within the context of the simulation.
Conventions of grammar, spelling, and word usage	There is minimal control over grammar, spelling, and word usage and more than five errors in the release.	There is limited control over grammar, spelling, and word usage and four to five errors in the release.	There is strong control over grammar, spelling, and word usage and no more than three errors in the release.	There is strong control over grammar, spelling, and word usage and no more than one error in the release.



Appendix 1: *Econlowdown* Instructor Management Setup

Use this paper to register yourself as an instructor for *Econlowdown*. We recommend you use a personal email account since some Bank District firewalls may reject your confirmation email. Please follow the instructions below.

1. Go to <https://www.econlowdown.org/>.
2. Click **Register** on the left side.
3. Enter information into the required fields on the form and click **Submit**.
4. Go to your email account and check for a confirmation email.
If you do not see the confirmation email in your inbox, check your spam/junk folder, it may be in that location.
5. Follow the information provided in your confirmation email and log onto the instructor management panel.
6. Click on **My Classrooms**.
7. Enter the information into the Class Name, Begin Date, and End Date fields, for example:
Class Name: Spring 2017 Economics 1st Period
Begin Date: 02/11/17
End Date: 05/25/17
8. Click **+Create**. The classroom name should appear in the left navigation.
9. Click **Add Students**. Several options are available:
 - a. Auto-create student names like Student A, Student B, and so forth.
 - b. "Import student list" allows you to pull from a spreadsheet saved on your computer. Your file must be saved in CSV format. (You can save any Excel document in this format by choosing **File>Save as** while in an Excel file and using the dropdown box to choose CSV.)
 - c. Type student names directly into the program.
10. Click the **Add Students** button under your classroom name to add students.
11. To add Written Assessments:
 - a. Click Written Assessments on the left side of the screen under your class name.
 - b. Click Create New Assessment.
 - c. Complete the fields and click Create Assessment. (You can copy and paste the writing assignment into the Prompt field.)
12. To assign the Comparative Advantage online course, click Courses under your classroom on the left and then click Add New Module.
13. Click on Comparative Advantage and select Add to Classroom.
14. To print Student Login Instructions, click Students and then the button for **Print Student Login**. You will have an opportunity to type written instructions for your students prior to exporting student login data. Type your instructions, if any, and click Submit. Print the Word file that pops up. You could also print the login list and cut it into strips to save paper. You will see a list of all the course and video options.

Standards and Benchmarks

National Standards for Economic Education

Content

Standard 6: Specialization

Students will understand that when individuals, regions, and nations specialize in what they can produce at the lowest cost and then trade with others, both production and consumption increase.

- a. Students will be able to use this knowledge to explain how they can benefit themselves and others by developing special skills and strengths.
- b. Grade 8 Benchmarks:
 1. Produce an item using a simulated production process and compute output per worker.
- c. Grade 12 Benchmarks:
 1. Apply the concepts of opportunity cost and comparative advantage to the following problem: the Netherlands can produce in one day either four drill presses or eight embroidered tablecloths. Using the same amount of resources, Portugal can produce either two drill presses or seven embroidered tablecloths. Which country should specialize in producing drill presses and import tablecloths, and why? Which country should specialize in producing tablecloths and import drill presses, and why?

Common Core Standards

High School Math

Understand and evaluate random processes underlying statistical experiments

CCSS.Math.Content.HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

CCSS.Math.Content.HSS-IC.B.4 Use data from a sample survey to estimate a population mean or proportion.

High School Language Arts—Reading Informational Text

Key Ideas and Details

CCSS.ELA-Literacy.RI.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Integration of Knowledge and Ideas

CCSS.ELA-Literacy.RI.11-12.7 Integrate and evaluate multiple sources of information presented in different media or formats (such as visually, quantitatively) as well as in words in order to address a question or solve a problem.

High School Language Arts—Social Studies Writing Standards

Text Types and Purposes

CCSS.ELA-Literacy.WHST.11-12.1

Write arguments focused on *discipline-specific content*.

CCSS.ELA-Literacy.WHST.11-12.1b Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

Production and Distribution of Writing

CCSS.ELA-Literacy.WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Research to Build and Present Knowledge

CCSS.ELA-Literacy.WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.