

# 12.3.1 Lesson 8

## Introduction

In this lesson, students read and analyze pages 243-249 of *Guns, Germs, and Steel* (from “Where do innovations actually come from? For all societies” to “induced numerous investors to lend money to Gutenberg”). In this excerpt, the author explores the roles of different factors in the diffusion of technology.

Students continue to explore elements of argument by identifying Diamond’s claims in this lesson’s excerpt and discussing how he uses evidence and reasoning to support his claims. Students read and discuss in small groups, tracking evidence and reasoning and discussing how both support the claim. Student learning is assessed via a Quick Write at the end of the lesson: Identify one of Diamond’s claims and analyze how he uses evidence and reasoning to support the claim.

For homework, students select a previously analyzed excerpt, identify at least two of Diamond’s claims, and analyze how he uses evidence and reasoning to support these claims.

## Standards

Assessed Standard(s)	
CCRA.R.8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
Addressed Standard(s)	
W. 11-12.9.b	<p>Draw evidence from literary or informational texts to support analysis, reflection, and research.</p> <p>b. Apply <i>grades 11-12 Reading standards</i> to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., The Federalist, presidential addresses]").</p>

SL. 11-12.1.a	<p>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grades 11-12 topics, texts, and issues</i>, building on others' ideas and expressing their own clearly and persuasively.</p> <p>a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</p>
L. 11-12.4.a,c	<p>Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on <i>grades 11-12 reading and content</i>, choosing flexibly from a range of strategies.</p> <p>a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.</p> <p>c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.</p>

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## Assessment

### Assessment(s)

Student learning is assessed via a Quick Write at the end of the lesson. Students respond to the following prompt, citing textual evidence to support analysis and inferences drawn from the text.

- Identify one of Diamond's claims and analyze how he uses evidence and reasoning to support the claim.

### High Performance Response(s)

A High Performance Response should:

- Identify a claim (e.g., "The importance of an invention's diffusion potentially exceeds the importance of the original invention" (p. 247) because technological innovation "catalyzes" (p. 247) itself).
- Analyze how the author uses evidence and reasoning to support the claim (e.g., Diamond cites as evidence the "thousands of years of human experience" working with softer metals and "thousands of years of development of simple furnaces" that were necessary to make iron a "common" material (p. 248). Diamond reasons that "advances depend upon previous mastery of simpler problems" (p. 248), explaining that it is difficult to invent a new technology when people have not yet learned certain skills or solved "simpler problems." Also, in his description of the Gutenberg press, Diamond provides the evidence that the machine was a "recombination" of "six technological advances ... in paper, moveable type, metallurgy, presses, inks, and scripts" (p. 248), all of which ensured the success of Gutenberg's printing press. However, he reasons that Crete's Phaistos disk did not endure, which was based on a similar technology, because the advances to make this technology easy to use were not yet available. Diamond also reasons that new technologies and materials make it possible to discover or create more new technologies "by recombination" (p. 248) of existing technologies into something new.).

## Vocabulary

**Vocabulary to provide directly (will not include extended instruction)**

- rotary quern (n.) - a primitive, hand-operated mill for grinding grain
- camera obscura (n.) - a darkened box-like device in which images of external objects, received through a small hole, are exhibited in their natural colors on a surface arranged to receive them; used for sketching, exhibition purposes, etc.
- vis-à-vis (adv.) - in relation to; compared with
- convulsed (v.) - disrupted the normal running of (a country, etc.)
- catalyze (v.) - to cause or accelerate a (chemical) change by the addition of a catalyst (something that causes a change)
- truncated (v.) - shortened by or as if having a part cut off; cut short

**Vocabulary to teach (may include direct word work and/or questions)**

- diffuse (v.) - to spread or cause to spread in all directions

**Additional vocabulary to support English Language Learners (to provide directly)**

- espionage (n.) - the things that are done to find out secrets from enemies or competitors; the activity of spying
- millennia (n.) - periods of 1,000 years

## Lesson Agenda/Overview

Student-Facing Agenda	% of Lesson
<b>Standards &amp; Text:</b> <ul style="list-style-type: none"> <li>• Standards: CCRA.R.8, W.11-12.9.b, SL.11-12.1.a, L.11-12.4.a,c</li> <li>• Text: <i>Guns, Germs, and Steel</i> by Jared Diamond, pages 243-249</li> </ul>	
<b>Learning Sequence:</b> <ol style="list-style-type: none"> <li>1. Introduction of Lesson Agenda</li> <li>2. Homework Accountability</li> <li>3. Reading and Discussion</li> <li>4. Reasoning and Evidence Discussion</li> <li>5. Quick Write</li> <li>6. Closing</li> </ol>	<ol style="list-style-type: none"> <li>1. 5%</li> <li>2. 15%</li> <li>3. 30%</li> <li>4. 30%</li> <li>5. 15%</li> <li>6. 5%</li> </ol>

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## Materials

- Student copies of the Surfacing Issues Tool (refer to 12.3.1 Lesson 2) (optional)—students may need additional blank copies
- Student copies of the Short Response Rubric and Checklist (refer 12.3.1 Lesson 1) (optional)

## Learning Sequence

How to Use the Learning Sequence	
Symbol	Type of Text & Interpretation of the Symbol
10%	Percentage indicates the percentage of lesson time each activity should take.
no symbol	Plain text indicates teacher action.
	<b>Bold text indicates questions for the teacher to ask students.</b>
	<i>Italicized text indicates a vocabulary word.</i>
►	Indicates student action(s).
☞	Indicates possible student response(s) to teacher questions.
❗	Indicates instructional notes for the teacher.

### Activity 1: Introduction of Lesson Agenda

5%

Begin by reviewing the agenda and the assessed standard for this lesson: CCRA.R.8. In this lesson, students engage in an evidence-based discussion to identify the author's claims, supporting evidence, and reasoning regarding the different factors at play in the diffusion of technology.

- Students look at the agenda.

### Activity 2: Homework Accountability

15%

Instruct students to take out their responses to the first part of the previous lesson's homework assignment. (Read and annotate pages 243-249 of *Guns, Germs, and Steel*.) Instruct students to form pairs to discuss their responses.

- Student annotation may include:
    - Star next to “The relative importance of local invention and of borrowing depends mainly on two factors: the ease of invention ... and the proximity of the particular society to other societies” (p. 243), because this appears to be a central point in this excerpt.
    - Star next to “The importance of diffusion ... is strikingly illustrated by some otherwise incomprehensible cases of societies that abandoned powerful technologies” (p. 246), because this describes a historical pattern that contradicts an established pattern.
    - Exclamation point near the story of the samurai on pages 246-247, because this explains why swords were preferred over guns in Japan.
    - Star next to the phrase “[t]hese examples, at first so bizarre to us, illustrate well the roles of geography and of diffusion in the history of technology” (p. 247), because Diamond suggests that these are the most important historical factors in the adoption of new technologies across cultures.
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Instruct student pairs to share and discuss the vocabulary words they identified and defined in the previous lesson’s homework (L.11-12.4.c).

- Students may identify the following words: *rotary quern*, *camera obscura*, *vis-à-vis*, *convulsed*, *catalyze*, and *truncated*.
  - **Differentiation Consideration:** Students may also identify the following words: *espionage* and *millennia*.
  - Definitions are provided in the Vocabulary box in this lesson.
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Instruct students to take out their responses to the second part of the previous lesson’s homework. (Continue the research process by surfacing issues and posing inquiry questions as you read and analyze the text.) Instruct students to share their responses.

- Student responses may include:
  - **Surfaced issues:** diffusion, peaceful trade, espionage, blueprint copying of technology, geographic isolation, fads, government or ruling-class regulations, technological reversals, technology begets technology
  - **Potential inquiry questions:** What is the relationship between diffusion and economic growth? How can peaceful trade develop interdependence between

societies? How should a society deal with spies who steal inventions or intellectual ideas? How does geographic isolation affect a society's economy? What fads are beneficial for a society? How do governmental regulations help or harm societies? What factors affect a society's decision to abandon a technology?

- See the [Model Surfacing Issues Tool](#) at the end of the lesson for more detail regarding surfaced issues.

### Activity 3: Reading and Discussion

30%

Instruct students to form small groups. Post or project each set of questions below for students to discuss. Instruct students to continue to annotate the text as they read and discuss (W.11-12.9.b).

- If necessary to support comprehension and fluency, consider using a masterful reading of the focus excerpt for the lesson.
- **Differentiation Consideration:** Consider posting or projecting the following guiding question to support students in their reading throughout this lesson:

**Where does innovation come from?**

Remind students to continue to surface issues and pose inquiry questions as they analyze the text during this activity.

- **Differentiation Consideration:** For additional support, consider providing students with copies of the [Surfacing Issues Tool](#).

Instruct student groups to read pages 243-249 (from “Where do innovations actually come from?” to “induced numerous investors to lend money to Gutenberg”) and answer the following questions before sharing out with the class.

**Why did the wheel “diffuse rapidly ... over the Old World” (p. 244)? What might *diffuse* mean in this context? (L.11-12.4.a)**

- Because the wheel had high “utility” (p. 244) or functionality, it diffused, or spread, very quickly to other places. *Diffuse* might mean “to spread or move in all directions.”
- Consider providing students with the definition of *diffuse*.
  - Students write the definition of *diffuse* on their copies of the text or in a vocabulary journal.

**What factors promote potential diffusion of new technologies across societies?**

- Student responses may include:

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- Trade and travel can promote the diffusion of new technology because societies may “see or learn of the invention and adopt it” (p. 244), as in the case of “transistors from the United States to Japan in 1954” (p. 245).
- War or conflict can promote technology diffusion because societies “find themselves at a disadvantage vis-à-vis the inventing society” (p. 244), as in the case of muskets among New Zealand’s Maori tribe. Diamond describes how, during the Musket Wars, those Maori tribes who did not adopt muskets were “subjugated by tribes already armed with them” (p. 245); thus, the “musket technology” (p. 245) spread for survival purposes.
- Societies “embedded in the major continents” (p. 246) with shared boundaries or common trade routes diffuse technology more easily, as in the example of centrally located medieval Islam, which “acquired inventions from India and China and inherited ancient Greek learning” (p. 246).

### What factors counteract potential diffusion of new technologies?

- Student responses may include:
  - Geographical isolation counteracts potential diffusion. For example, the “Tasmanians had no contact with other societies for 10,000 years and acquired no new technology other than what they invented themselves” (p. 246).
  - Fads counteract potential diffusion, as in the example of the Japanese samurai suppressing the adoption of guns. The “samurai-controlled government began by restricting gun production” and then added subsequent restrictions until “Japan was almost without functional guns” (p. 247). Additionally, fads can persist when the culture is isolated. One example is that of “Aboriginal Tasmanians, who abandoned even bone tools and fishing to become the society with the simplest technology in the modern world” (p. 247). If Tasmania were not geographically isolated, this fad may not have persisted.

### How does the statement “technology begets more technology” relate to the “autocatalytic process” (p. 247)?

- Diamond suggests that the “autocatalytic” nature of invention is one that “speeds up at a rate that increases with time, because the process catalyzes itself” (p. 247). Therefore, “technology begets more technology” because as simpler technologies are invented they pave the way for new and more complex technologies to be invented (p. 247).

### What does the story of the Phaistos disk suggest about technological diffusion?

- Student responses should include:

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- The Phaistos disk was ahead of its time. There were “simpler problems” (p. 248) or technological advances that had not yet been developed, such as advances in metallurgy, that prevented the technology of the disk from being widely diffused. This example suggests that technological diffusion is dependent on timing: when other “simpler problems” (p. 248) are not yet solved, a complex technology will not diffuse easily to other cultures.
- The story of the Phaistos disk suggests that materials and technologies such as “paper, movable type, metallurgy, presses, inks, and scripts” (p. 248) support the adoption of newer technologies. However, when materials are not readily available, technology cannot be combined or created and thus cannot diffuse.

**What is Diamond’s answer to the question he poses on page 243: “Where do innovations actually come from?”**

- Diamond asserts that “technology begets more technology” (p. 247), suggesting that innovations lead to more innovations through the “diffusion” (p. 245) of each new technology. In this way, innovation is an “autocatalytic process” (p. 247) or a process that accelerates itself, as new technologies are diffused and used in the creation of other more complex technologies through “recombination” (p. 248).

Lead a brief whole-class discussion of student responses.

## Activity 4: Reasoning and Evidence Discussion

30%

In this activity, students work in their small groups from the previous activity to identify claims, as well as reasoning and evidence that support each claim. Instruct student groups to reread pages 243-249 and identify 2-3 claims.

- Students were introduced to *claims*, *evidence*, and *reasoning* in 12.3.1 Lesson 6.
- Remind students that because they are reading only excerpts from *Guns, Germs, and Steel*, they are not able to identify the author’s central claim. Instead, students focus on identifying multiple claims within the focus excerpts.
- **Differentiation Consideration:** If necessary, remind students of the following definitions:
  - **Argument:** The composition of precise claims about an issue, including relevant and sufficient evidence, and valid reasoning
  - **Central claim:** An author or speaker’s main point about an issue in an argument
  - **Supporting claim:** A smaller, related point that reinforces or advances the central claim
  - **Evidence:** The topical and textual facts, events, and ideas from which the claims of an argument arise, and which are cited to support those claims

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- **Reasoning:** The logical relationships among ideas, including relationships among claims and relationships across evidence
- Student responses may include:
  - “The importance of an invention’s diffusion potentially exceeds the importance of the original invention” (p. 247) because technological innovation “catalyzes” (p. 247) itself.
  - Societies “borrow[]” (p. 243), or adopt, inventions from other inventing societies because the original society lacking the invention can “find themselves at a disadvantage vis-à-vis the inventing society” (p. 244).
  - “Cultural diffusion can involve either detailed ‘blueprints’ or just vague ideas stimulating a reinvention of details.” (p. 245)
  - Items created directly from a “handling of natural raw materials ... developed at many different occasions in world history, at many places and times” (p. 243).
  - The Old World wheel design did not emerge “repeatedly by chance” (p. 244) at many different sites in the Old World.
  - Complex inventions are more likely to be “borrowed” (p. 243) than invented locally “because they spread more rapidly than they could be independently invented” (p. 244).
  - Societies are susceptible to “fads, in which economically useless things become valued or useful things devalued temporarily” (p. 246).
  - Diamond claims that “[w]ithout diffusion, fewer technologies are acquired and more existing technologies are lost” (p. 247).

Lead a brief whole-class discussion of student responses.

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Remind students that the concepts of *reasoning* and *evidence* are closely related; *reasoning* connects the *evidence* to the *claim*.

- Students listen.

Display the following examples from pages 247-248 to illustrate the relationship between claims, reasoning, and evidence:

- **Claim:** Complex inventions are more likely to be borrowed than invented locally “because they spread more rapidly than they could be independently invented” (p. 244).

- **Evidence:** Diamond provides the example of a complex invention, the Old World wheel (“a solid wooden circle constructed of three planks fastened together” (p. 244)), explaining how it spread to “much of Europe and Asia” (p. 244) over the next few centuries after it was originally invented.
- **Reasoning:** Diamond reasons that “[n]o one thinks that the same peculiar Old World design [of wheels] appeared repeatedly by chance at many separate sites of the Old World within a few centuries of each other, after 7 million years of wheelless human history” (p. 244), suggesting that the wheel and other high-utility inventions spread instead by rapid diffusion.

Ask students the following questions:

**How does the evidence support Diamond’s claim?**

- The evidence includes a specific historical example of a complex invention, the “Old World wheels” (p. 244) that “diffused” more rapidly than it could be invented. This evidence supports the claim because it shows an example of a technology that was more likely to be borrowed than invented.

**How does the reasoning connect the evidence to the claim?**

- Diamond connects the evidence of the wheel to the claim by describing the pattern and speed of its diffusion. He reasons that because of the similar design of the wheel found in different places, the wheel must have diffused rather than been invented locally. He further reasons that the complexity of the design drove the diffusion; a simpler design would have been easier for societies to develop on their own.

Lead a brief whole class discussion of student responses.

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Instruct student groups to select 2-3 claims surfaced in the previous discussion. Instruct students to find the claims in the text and annotate the text for evidence and reasoning that supports the selected claims. Explain to students that for each selected claim they should discuss one example of evidence and one example of reasoning, and explain how both support the selected claim.

- Student groups select claims from the previous discussion and annotate the text for the corresponding reasoning and evidence that supports the selected claim.
- The identified claims can be found on pages 243-249 of *Guns, Germs, and Steel*.
- Consider reminding students of their previous work with SL.11-12.1.a, as this discussion requires that students come to class prepared and explicitly draw on evidence from the text to support their discussion.

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- Student responses may include:

- **Claim:** Societies borrow inventions from other “inventing societies” (p. 244) because the original society lacking the invention can “find themselves at a disadvantage vis-à-vis the inventing society” (p. 244).

**Evidence:** Diamond uses the example of “the spread of muskets among New Zealand’s Maori tribes” (pp. 244-245). New Zealand was “convulsed” (p. 245) by the Musket Wars, in which musket-less tribes had to adopt muskets or be “subjugated” (p. 245) by tribes that had already adopted muskets. Diamond states that the “outcome was that musket technology had spread throughout the whole of New Zealand by 1833” (p. 245). Tribes either had to adopt the technology or be defeated.

**Reasoning:** “[S]ocieties lacking the invention find themselves at a disadvantage vis-à-vis the inventing society, and they become overwhelmed and replaced if the disadvantage is sufficiently great.” (p. 244)

- **Claim:** “Cultural diffusion can involve either detailed ‘blueprints’ or just vague ideas stimulating a reinvention of details.” (p. 245)

**Evidence:** Diamond provides examples of blueprint technology diffusion, including “emigration (the spread of French glass and clothing manufacturing techniques over Europe by the 200,000 Huguenots expelled from France in 1685)” and “the transfer of Chinese papermaking techniques to Islam” (p. 245). Diamond also provides an example of “vague ideas” (p. 245) in Chinese porcelain technology. Diamond states that “many unsuccessful attempts were made to imitate it” but only after “lengthy experiments with processes and with mixing various minerals and clays together” (p. 245) was Johann Böttger able to replicate porcelain.

**Reasoning:** Diamond includes these examples to illustrate blueprint technology diffusion: through the examples of French glass and Chinese papermaking, the techniques, not the products, were diffused. Regarding the “vague ideas” that stimulated reinvention, he states, “European potters had to reinvent Chinese manufacturing methods for themselves, but they were stimulated to do so by having models of the desired product before them” (p. 245).

- **Claim:** Diamond claims that “technologies must not only be acquired, but also maintained” (p. 246) or reacquired by diffusion.

**Evidence:** To support this claim, Diamond provides specific examples of fads that did not allow technology to be maintained, but due to geographic isolation, led to technology reversal. One example is in Japan, where the samurai-controlled government introduced restrictions until “Japan was almost without functional

guns again” (p. 247). China also abandoned “oceangoing ships (as well as ... mechanical clocks and water-driven spinning machines)” (p. 247). Diamond provides other examples of Aboriginal societies that lost the technologies of “bone tools and fishing” and “bows and arrows” (p. 247) due to isolation. **Reasoning:** Diamond reasons that “[a] society that temporarily turned against a powerful technology would continue to see it being used by neighboring societies and would ... reacquire it by diffusion ... [b]ut such fads can persist in isolated societies” (p. 246).

## Activity 5: Quick Write

**15%**

Instruct students to respond briefly in writing to the following prompt:

**Identify one of Diamond’s claims and analyze how he uses evidence and reasoning to support the claim.**

Instruct students to look at their annotations to find evidence. Ask students to use this lesson’s vocabulary wherever possible in their written responses.

- Students listen and read the Quick Write prompt.
- Display the prompt for students to see, or provide the prompt in hard copy.

Transition to the independent Quick Write.

- Students independently answer the prompt using evidence from the text.
- See the High Performance Response at the beginning of this lesson.
- Consider using the Short Response Rubric to assess students’ writing. Students may use the Short Response Rubric and Checklist to guide their written responses.

## Activity 6: Closing

**5%**

Display and distribute the homework assignment. For homework, instruct students to select a previously analyzed excerpt, identify at least two of Diamond’s claims, and analyze how he uses evidence and reasoning to support these claims.

- Students follow along.
- The previously read excerpts of *Guns, Germs, and Steel* are pages 13-25, 65-78, and 229-249.

## Homework

Select a previously analyzed excerpt, identify at least two of Diamond's claims, and analyze how he uses evidence and reasoning to support these claims.

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## Model Surfacing Issues Tool

<b>Name:</b>		<b>Class</b> :		<b>Date</b> :	
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**Directions:** As you read, look for issues that are suggested in the text. Remember that an issue is an important aspect of human society for which there are many different opinions about what to think or do. Summarize the issue succinctly, and note the page number and what the text says about the issue in the correct columns.

Issue	Page(s)	Key information about the issue from the text
Peaceful trade	245	“[P]eaceful trade” (p. 245) is one way in which technologies diffuse.
Espionage	245	“[E]spionage” (p. 245), or spying, is another way in which technologies diffuse across societies.
Blueprint copying of technology	245	Blueprint copying of technology is when one society gains the design or technique (the “blueprint” (p. 245)) from another society and is able to reproduce products using the blueprint.
Geographic isolation	246	Diamond describes geographic isolation as one of the main reasons “fads can persist” (p. 246). When fads persist, societies may abandon or lose useful technologies.

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Fads	246	Fads are social movements, “in which economically useless things become valued or useful things devalued temporarily” (p. 246). Fads can lead to technological reversals, instances where societies lose or abandon useful innovations.
Government or ruling-class regulations	247	The Japanese samurai social class was able to create a Japan with almost no “functional guns” (p. 247) because of government regulations that led to a technological reversal of guns in Japan.
Technological reversals	247	Technological reversals are the loss of technology due to fads or social movements. These “reversals” (p. 247) persist typically due to geographic isolation.
Technology begets technology	248	Technology creates more technology by improving upon “simpler problems” (p. 248) and generating new technologies through “recombination” (p. 248).
Diffusion	248	Technology diffuses or spreads from society to society through various interactions between the societies. Diffusion of technology does not just lead to the diffused technology itself but can contribute to new innovation that can arise from the diffused technology (“recombination” (p. 248)).



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