

Logic Unit Study

By Gypsy Gameschooler

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Check out my book, *Gameschooling on a Budget*, for tips and games to play for less.

Don't forget to check out **Pizza Parlor**, a fractions game for 1-6 players!

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Logic Lessons

- ☐ [Khan Academy](#): They have an [entire class on philosophy](#), but we only used the [first unit on critical thinking](#). These lessons covered [types of arguments](#), validity and soundness, [logical fallacies](#), and [cognitive biases](#).

Lesson 1 on fundamentals includes questions to answer to demonstrate learning. These continue into lesson 2, fallacies, but drop off toward the end. Lesson 3, on cognitive biases, is only videos.

If you want to continue into philosophy, [Unit 3 Lesson 1 \(on Ethics\)](#) and [Unit 4](#) are great. The rest are great for older students who are more interested in religion and philosophy.

- ☐ [Short video on logical fallacies](#)
- ☐ [Digital Commons has a lesson on finding logical fallacies in a documentary](#).

Exercises

- ☐ Find fallacies within sensationalist talk shows like Jerry Springer (parent discretion advised; only you can know if these are appropriate for your children, but they often contain adult themes).
- ☐ Find fallacies within political debates - we especially enjoyed playing Logical Fallacy Bingo (included)
- ☐ [Hold a debate!](#)

Logical Fallacies Cheat-Sheet

Formal - problem in the form

Affirming the Consequent - if A, then B. B. Therefore, A

Denying the Antecedent - if A, then B. Not A. Therefore, not B.

Informal - problem in the content

Division - if a big thing has a property, then its constituents have the same property

Composition - if a little thing has a property, then the thing it's part of has the same property

Biased Sample - Using biased collection techniques for acquiring data about a population

Hasty Generalization Fallacy - if it's true in one situation, then it must be true in all situations

Either-Or Fallacy - puts listeners in a false dilemma so it seems like only 2 choices are available, and only one is right

Post hoc ergo propter hoc ("False Cause Fallacy") - "after this, therefore because of this."

Causation vs correlation. Superstition.

Confusing Cause and Effect - A and B occur together, but do not have a common cause. A is assumed to cause B

Fallacy of Ignoring a Common Cause - Assumes A causes B, when something else causes them both.

Appeal to the people ("Bandwagon Fallacy") - establishes the truth of a statement based on popularity of statement. Exceptions: etiquette, language, manners.

Begging the Question - premise is unsupported.

Equivocation - argument shifts between different meanings of a single word.

Straw Man - attacks a position that was never presented

Slippery Slope - once one event occurs, other related events will follow, and this will eventually lead to undesirable consequences

Red Herring - the conclusion doesn't follow the premise; trying to distract

An Appeal to Authority - someone claims to be an authority on a subject, makes a claim without further justification

Appeal to Fear - use fear to convince someone

Circular Logic:

Circularity by Equivalency - say the same thing twice by using synonyms

Circularity by Dependency - premise and conclusion are mutually dependent

Ad Hominem: "to the person"

Abusive - attacks the person, not the argument

Circumstantial - attacks circumstances, not argument; conflict of interest

Tu Quoque - "you also"; hypocrisy

Guilt by Association - argue against something because an unsavory person agrees with it

Genetic Fallacy - condemning an argument because of its origins (can also be used to support claims)

Ad Feminam - discredit a claim because a woman made it

Reading

- ☐ Sherlock Holmes
- ☐ Sophie's World (this is more of a philosophy book, but does go into logic some)
- ☐ For parents: the Lady Sherlock series, by Sherry Thomas

Watching

- ☐ Sherlock Holmes (there are several TV shows and movies; choose what you feel is appropriate for your children)
- ☐ Wishbone episode season 1, episode 8: [The Slobbery Hound](#)
- ☐ Star Trek: The Next Generation, season 2, episode 3: Elementary, Dear Data
- ☐ Star Trek: The Next Generation, season 6, episode 12: Ship in a Bottle
- ☐ Star Trek VI: The Undiscovered Country
- ☐ Downton Abbey (early 20th-century historical fiction, again, pre-screen to determine if it is appropriate for your children)
- ☐ [The Argument Clinic](#)

Games

- ☐ Clue (any version; there are several)
- ☐ [221B Baker Street](#)
- ☐ Alibi
- ☐ Carmen Sandiego
- ☐ [Logic Escape Room](#)
- ☐ [Causes of WWI Scavenger Hunt](#)
- ☐ [Whodunnit Escape Room](#)

Logical Fallacy

BINGO

Begging the Question	Red Herring	Post hoc ergo Proptor hoc	Abusive	Biased Sample
Confusing Cause and Effect	Slippery Slope	Hasty Generalization	Appeal to the People	Genetic Fallacy
Denying the Antecedent	Equivocation	Straw Man	Tu Quoque	Fallacy of Composition
Circumstantial	Guilt by Association	An Appeal to Authority	Affirming the Consequent	Circular Logic
Ad Feminam	Fallacy of Division	Appeal to Fear	Fallacy of Ignoring a Common Cause	Either-Or Fallacy

Logical Fallacy

BINGO

Appeal to the People	Red Herring	Fallacy of Division	Abusive	Hasty Generalization
Confusing Cause and Effect	Circular Logic	Circumstantial	Either-Or Fallacy	Guilt by Association
Appeal to Fear	Equivocation	Straw Man	Begging the Question	Fallacy of Composition
Tu Quoque	Slippery Slope	An Appeal to Authority	Affirming the Consequent	Post hoc ergo Propter hoc
Ad Feminam	Denying the Antecedent	Biased Sample	Genetic Fallacy	Fallacy of Ignoring a Common Cause

Logical Fallacy

BINGO

An Appeal to Authority	Tu Quoque	Equivocation	Circular Logic	Fallacy of Composition
Confusing Cause and Effect	Affirming the Consequent	Circumstantial	Ad Feminam	Guilt by Association
Appeal to Fear	Hasty Generalization	Straw Man	Begging the Question	Appeal to the People
Abusive	Slippery Slope	Either-Or Fallacy	Fallacy of Division	Post hoc ergo Propter hoc
Red Herring	Denying the Antecedent	Biased Sample	Genetic Fallacy	Fallacy of Ignoring a Common Cause

Logical Fallacy

BINGO

An Appeal to Authority	Tu Quoque	Abusive	Circular Logic	Denying the Antecedent
Fallacy of Ignoring a Common Cause	Post hoc ergo Proptor hoc	Circumstantial	Ad Feminam	Confusing Cause and Effect
Affirming the Consequent	Biased Sample	Straw Man	Hasty Generalization	Appeal to the People
Guilt by Association	Slippery Slope	Either-Or Fallacy	Fallacy of Division	Fallacy of Composition
Red Herring	Begging the Question	Equivocation	Genetic Fallacy	Appeal to Fear

Late 19th/Early 20th Century History

In the late 19th to early 20th century, the world witnessed remarkable changes across the United States, the United Kingdom, and Western Europe, shaping the way we live today.

The period began with the Industrial Revolution, a time of incredible innovation. In 1876, Alexander Graham Bell invented the telephone. Thomas Edison is credited with the invention of the electric light bulb in 1879. Meanwhile, Karl Benz introduced the world's first automobile in 1885. It wasn't until the early 1900s that these inventions became commonplace.

The Titanic was supposed to be the unsinkable ship. It set sail from Southampton on April 11, 1912, and sunk just four days later when it struck an iceberg. World War I took place from 1914-1918. You can learn more about the causes of WWI in the included [scavenger hunt](#).

Amidst the turmoil, voices for change emerged. In 1893, New Zealand led the way, becoming the first country to grant women the right to vote. In 1918, the United Kingdom followed suit, allowing some women over 30 to vote. It wasn't until 1920 in the United States that women gained this right nationwide, with the passage of the 19th Amendment.

Following the war, the 1920s ushered in a period of economic prosperity and cultural dynamism, known as the Roaring Twenties. Jazz music filled the air, flappers challenged societal norms, and the stock market soared. It was a time of newfound freedom and innovation.

However, the good times didn't last. The late 1920s saw the stock market crash in 1929, plunging the world into the Great Depression. It was a time of widespread unemployment, poverty, and despair, with economies around the globe struggling to recover.

As economic hardship gripped the world, political turmoil followed. Totalitarian regimes rose to power in countries like Germany, led by Adolf Hitler; Russia, led by Joseph Stalin; and Italy, led by Benito Mussolini. These dictators exerted total control over their citizens, leading to repression and conflict.

In summary, the late 19th to early 20th century was a time of immense change and upheaval across the United States, the United Kingdom, and Western Europe. From the transformative impact of the Industrial Revolution to the devastation of World War I and the struggles of the Great Depression, this period shaped the course of history and laid the foundation for the modern world we inhabit today.

Science Experiments

Using the Empirical Method

Sophie's World went into the development of empirical research during the Scientific Revolution (1500-1700). We still use this reliance on physical, measurable evidence in science today.

The scientific method was developed during this time as a way to accurately and reliably learn about the world around us. What is a question you have about your world? Develop your own scientific experiment following the scientific method.

Background Research

Your first step is to do some research. This research might be done using books, the internet, documentaries, real-world observations, or any combination. Write down your findings in an organized fashion.

Question

What question do you have? Write it down, and be as specific as possible. Ideal questions have yes or no answers. For example, “Does coffee help grass grow better than water?” is a better, more specific question than “What helps grass grow?”

Hypothesis

Based on your previous research, what do you think the answer to your question will be? This is an educated guess, backed up by your background knowledge.

Materials

List out exactly what you will use in your experiment. Amounts, brands, etc; be as specific as possible. Remember, a key aspect of any scientific study is that another scientist can follow your exact process and get the same results.

Methods

Again, be as specific as possible. Include every detail; leave nothing to assumption. A vital component of the scientific method is that variables are limited, so each experiment tests only one variable. This means that if you are testing how pea plants grow in different conditions, you will keep all but one variable constant. If

you keep light, temperature, altitude, soil, and fertilizer consistent, you can vary the amount that you water across samples.

Good scientific experiments have large sample sizes, several trials, and only vary one variable. A good way to do this is to start with every subject being treated exactly the same, then choose just one thing to change. If you're testing the best amount of water to give a pea plant, for example, keep the source of water the same, the drainage of the pots the same, even the time you water them the same. One group can get no water, one group gets a teaspoon, one gets a tablespoon, and one gets half a cup at every watering.

Make sure that you measure everything to make sure you're not inadvertently introducing more variables than you want to.

Data Collection

The scientific method relies on empirical evidence. This is evidence we can see, hear, touch, and measure. Modern scientists working in labs have all sorts of equipment to measure all kinds of things, from noise levels, light levels, chemical levels, and more. At home, we don't have the ability to measure quite as many different things, but we can weigh things, measure their dimensions, and record the colors we see.

Results

This is when you can create graphs of your data. You can find the mean (average), median, and mode. If you enjoy statistics, you might enjoy finding the standard deviation of your data. This is when you are compiling it so it is easier to make sense of.

Conclusion

Interpret your results within the context of your background information. Sometimes, results are inconclusive, which is still more information; it tells us that more studies are needed, perhaps different methods or measuring methods are required. Hopefully, though, you'll be able to report on whether your hypothesis was correct or not. This is also the time during which additional questions for further study can be posited.

Experiment Title: _____

Background Information: _____

Question: _____

Hypothesis: _____

Materials (specifics): _____

Methods (specifics): _____

Data Collection

[illegible]

Results: _____

Conclusion: _____

Write a Persuasive Essay

Using your newfound logical skills, write an essay to persuade someone to your way of thinking. Do you want to convince your parent to adopt a pet? Do you think you should get that new video game or console?

Use the outline on the next page to help you formulate your essay. Remember to use logical, valid, and sound arguments to help convince your audience.

Writing an Outline

1. Pick a topic
2. Choose your three main points.
3. These three main points go under the Introduction a., b., and c. and under the Conclusion a., b., and c.
4. Also write these three main points at 2., 3., and 4.
5. Find three supporting points for each of your main points, and place them at a., b., and c. under 2., 3., and 4.

Using Your Outline

Each of your main number points (1., 2., 3., 4., and 5.) is a separate paragraph. Each of your subpoints (a., b., and c.) should be one sentence. When you are finished fleshing out your outline into your full essay, each paragraph will be 3-5 sentences long.

Essay Topic: _____

1. Introduction

a. _____

b. _____

c. _____

2. _____

a. _____

b. _____

c. _____

3. _____

a. _____

b. _____

c. _____

4. _____

a. _____

b. _____

c. _____

5. Conclusion

a. _____

b. _____

c. _____

Grading Rubrics

What your child produces will depend on their capabilities. Use this as a rough guide, but don't be afraid to modify it to meet your child's needs.

Early Elementary

- Very basic; write 1-2 sentences OR
- Dictate a more complicated story/essay to parents that you, the parent, write down
- Correct mechanics with your child.

Mechanics: spelling, punctuation, and grammar

Late Elementary				
	Length	Organization	Mechanics	Content
4 points	3+ paragraphs; 4-5 sentences/ paragraph	There is an introduction, body, and conclusion	Up to 2 mechanical errors	The topic is clearly defined and there are 3 or more supporting, logical points
3 points	3 paragraphs, 3 sentences/ paragraph	There is a clear beginning, middle, and end	3-5 mechanical errors	The topic is defined and there are 2-3 supporting, logical points
2 points	2 paragraphs, 2-3 sentences/ paragraph	There is some organization of supporting points	6-10 mechanical errors	The topic is loosely defined and there are 1-2 supporting points
1 point	1 paragraph, 3 sentences/ paragraph	There is little organization	More than 10 mechanical errors	The topic is barely defined with little or no supporting points

Middle School					
	Length	Organization	Mechanics	Content	Style
4	5 paragraphs; 5 sentences/ paragraph	There is an introduction, 3 body paragraphs, and conclusion	Up to 2 mechanical errors	The topic is clearly defined and there are 3 or more supporting, logical points	Clear voice and style, consistent throughout
3	4 paragraphs, 4 sentences/ paragraph	There is a clear beginning, middle, and end	3-5 mechanical errors	The topic is defined and there are 2-3 supporting, logical points	Voice and style is mostly consistent
2	3 paragraphs, 3 sentences/ paragraph	There is some organization of supporting points	6-10 mechanical errors	The topic is loosely defined and there are 1-2 supporting points	Voice or style is somewhat present
1	2 paragraphs, 3 sentences/ paragraph	There is little organization	More than 10 mechanical errors	The topic is barely defined with little or no supporting points	Voice and style are not developed

High School					
	Length	Organization	Mechanics	Content	Style
4	1-3 pages, 7+ paragraphs	There is an introduction, 5+ body paragraphs, and conclusion	Up to 2 mechanical errors	The topic is clearly defined and there are 5 or more main supporting, logical points	Clear voice and style, consistent throughout
3	5 paragraphs, 5 sentences/ paragraph	There is a clear beginning, middle, and end	3-5 mechanical errors	The topic is defined and there are 4 supporting, logical points	Voice and style is mostly consistent
2	4 paragraphs, 4 sentences/ paragraph	Supporting points are mostly organized into paragraphs	6-10 mechanical errors	The topic is loosely defined and there are 3 supporting points	Voice or style is somewhat consistent
1	3 paragraphs, 3 sentences/ paragraph	There is some organization of supporting points	More than 10 mechanical errors	The topic is loosely defined and there are 1-2 supporting points	Voice or style is somewhat present