

Lesson Four

Evaluating Evidence and Reasons/Reasoning

OVERVIEW

The purposes of Quality Talk (QT) Lesson Four is to overview how to evaluate evidence and reasons/reasoning. The lesson will begin with a review of previous materials, including the six secondary question types introduced in Lesson Three as well as a review of what evidence and reasons/reasoning are. Next, the “ARC” test for evaluating evidence will be introduced as a way for students to consider the accuracy, relevance, and credibility of the evidence.

Lesson Four also introduces how to evaluate reasons and reasoning based on their strength. Reasons should be logical and relevant to the claim; reasoning should include relevant mathematical or scientific principles and should connect evidence to the claim.

Finally, Lesson Four includes an example of how interns could introduce evaluation of evidence and reasons/ reasoning to elementary students and provides a practice activity.

OBJECTIVES

At the end of this lesson, students will be able to:

- ◆ describe different sources of evidence and examples of the types of evidence that could be used in different content areas;
- ◆ use the “ARC” test to evaluate the evidence used to support a claim;
- ◆ explain how to determine whether their reasons/reasoning add weight to their argument; and,
- ◆ consider how they would instruct students how to evaluate their evidence and reasons/reasoning in an elementary classroom.

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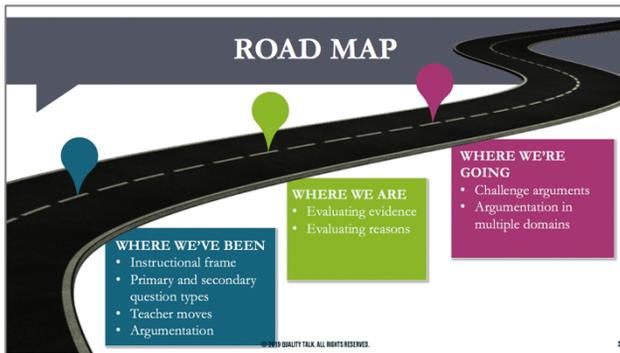
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MATERIALS

- ◆ QT Math PST Lesson 4 Slides
- ◆ QT Math PST Lesson 4 - Workbook

Part 1. Review

1.1 Road Map



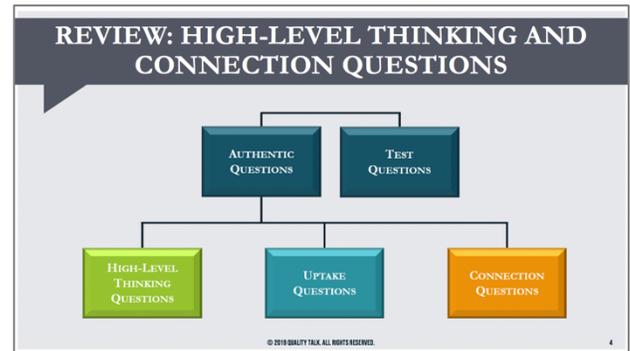
Display **Slide 3**, which shows what interns have learned so far, what they will be learning during this lesson, and what they will learn in future lessons.

Remind interns that in the first Quality Talk lesson, they learned about the instructional frame and the first three question types. In Lesson Two, they learned about teacher moves and were introduced to argumentation. Finally, Lesson Three built upon the three primary question types from Lesson One, and introduced six secondary authentic question types.

In this lesson, interns will build on their knowledge of argumentation by learning about how to evaluate evidence using the ARC test and how to determine the strength of the reasons or reasoning used in an argument.

In future lessons, interns will learn more about how to use argumentation to challenge others' arguments during a discussion in order to reach a more thorough understanding. They will also learn about how argumentation may look different in different content areas. For example, a strong argument in language arts may not use the same kinds of evidence and reasons or reasoning as a strong argument in mathematics.

1.2 Secondary Question Types



Display the representation on **Slide 4** that shows the main question types and categories of secondary authentic questions. Remind interns that in the third QT lesson, they learned about the three types of high-level thinking questions and the three types of connection questions.

Review each question type.

There are three types of high-level thinking questions. **Speculation questions** require students to consider alternative possibilities. They often take the form of “What if ...?” questions. **Generalization questions** require students to build up ideas and generate new information by tying concepts and ideas together. **Analysis questions** required students to break down concepts, ideas or arguments.

There are three types of connection questions. **Affective questions** elicit connection between a student's life experience and the text or content. **Shared knowledge questions** elicit connection to information that is commonly known in the discussion groups, such as references to previous discussions, experiences, or class topics. **Inter-textual questions** elicit connections between two or more textual materials such as books, data, diagrams, movies, the internet, etc.

1.3 Evidence and Reasons/ Reasoning

**REVIEW: EVIDENCE AND REASONS/
REASONING**

EVIDENCE	REASONS AND REASONING
<ul style="list-style-type: none">✓ provides direct support for your reasons.✓ answers the question: "How do you know that?"	<ul style="list-style-type: none">✓ <i>Reasons</i> give support to a person's claim and explain why a person thinks their claim is valid.✓ Answer the question: "Why do you think so?"✓ <i>Reasoning</i> helps us explain the links between evidence and the claim.

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Display **Slide 5**, which reviews evidence and reasons/reasoning.

Remind interns that **evidence** provide direct support for a person's reasons. Evidence should answer the question: "How do you know that?"

Reasons give support to a person's claim and explain why a person thinks their claim is valid. It answers the question: "Why do you think so?"

Reasoning helps a person explain the link between evidence and the claim.

Inform interns that in this lesson, they will learn more about different sources of evidence and how to determine whether their evidence and reasoning are strong and add weight to their argument.

Part 2. Evaluating Evidence and Reasons/Reasoning

2.1 Evaluating Evidence



Display **Slide 6** to introduce Part 2 of the lesson.

Explain to interns that when they use evidence to support a claim they are making, they should consider whether that evidence is directly related to the claim as well as if it comes from a reliable source on the topic.

2.1.1 Sources of Evidence



Display **Slide 7**, which lists some possible sources of evidence, including texts, calculations, observations, experts, experience, and research. Briefly describe each of these sources. Also point out that there may be other sources of evidence not listed here.

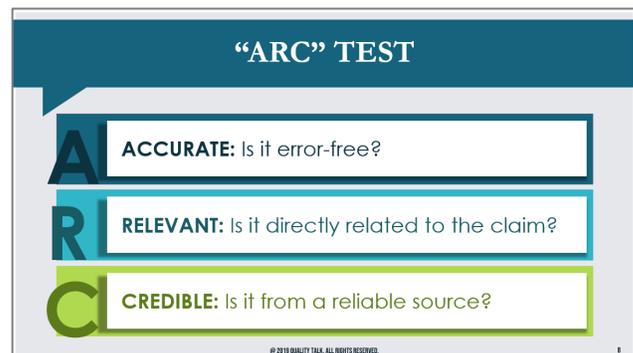
Explain to interns that some sources of evidence may be more relevant or more highly valued in some content areas than in others. For example, calculations – which can be performed by a student or shown in a text – are a common form of evidence used in

mathematics as well as science but are less common in areas like language arts or social studies.

Point out to interns that certain types of claims may be better supported by some types of evidence than others. For example, personal experiences may be excellent support for claims defending one’s opinions, but other claims may need supporting evidence from texts and/or evidence produced by experts. Add that experts should be expert in the field/topic of the claim. A doctor, as shown in the picture, would be an expert about health and illness, but would not be considered an expert on fire prevention. For that, a firefighter would be considered an expert.

Inform interns that the following slides will show them a way to determine whether the evidence they’re using is appropriate to support the claim they are making.

2.1.2 “ARC” Test



Display **Slide 8**, which shows a representation of the ARC test.

Inform interns that “ARC” is an acronym that stands for “Accurate, Relevant, Credible.” Each of these is an indicator that can be used to evaluate the strength of a piece of evidence.

Part 2. Evaluating Evidence and Reasons/Reasoning

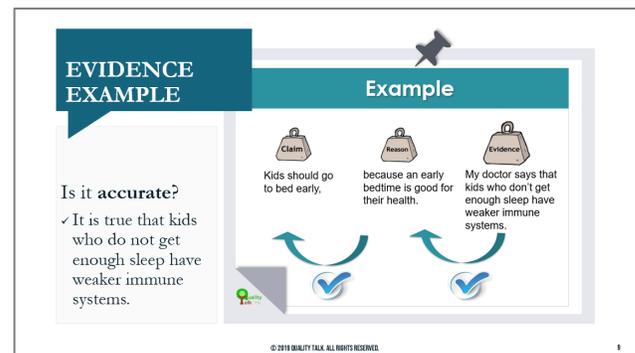
When determining whether a piece of evidence is appropriate, one can use the ARC test to consider whether the evidence is:

- ◆ **Accurate:** *Is it error-free?*
- ◆ **Relevant:** *Is it directly related to the claim?*
- ◆ **Credible:** *Is it from a reliable source?*

Evidence is that inaccurate would not be a good source of support for a claim. For example, if a student made a mistake while carrying out a scientific investigation and did not record what happened, any observations or data affected by that mistake would not be a good source of evidence.

Likewise, a piece of evidence may contain good information, but if it is not relevant to the claim one is trying to make, it is not appropriate to use. For example, if you wanted to make the claim that going to bed early is good for kids' health, citing evidence about how kids should eat healthy foods would not be considered relevant to the claim.

Finally, the credibility of the source of evidence also indicates whether or not it should be used to support a claim. If someone is trying to support a claim about climate change, an entry on a personal blog would not be considered a good source of evidence; instead, articles from a peer-reviewed journal or information from a professional organization like NASA would be considered credible sources.

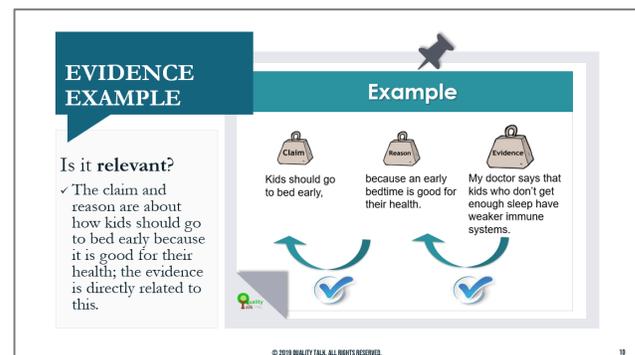


Display **Side 9**, which shows the following example argument:

- ◆ **Claim:** Kids should go to bed early,
- ◆ **Reason:** because an early bedtime is good for their health.
- ◆ **Evidence:** My doctor says that kids who don't get enough sleep have weaker immune systems.

Ask interns: Is it **accurate**?

It is true that kids who do not get enough sleep have weaker immune systems, therefore this piece of evidence is error free.



Display **Slide 10**, which shows the same argument.

Now ask interns: Is it **relevant**?

The claim and reason in the example are about how kids should go to bed early because it is good for their health. This piece of evidence is relevant because having a weaker immune system means that you are more likely to get sick.

Part 2. Evaluating Evidence and Reasons/Reasoning

EVIDENCE EXAMPLE

Example

Claim: Kids should go to bed early.

Reason: because an early bedtime is good for their health.

Evidence: My doctor says that kids who don't get enough sleep have weaker immune systems.

Is it credible?

✓ A doctor is a reliable source of information about health and illness.

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Display **Slide 11**.

Finally, ask interns: Is it **credible**?

The evidence cites a doctor as the source of this information. Since doctors are considered experts when it comes to health and illness, the source of evidence would be considered credible.

Because the evidence in this example is considered accurate, relevant, and credible, it passes the ARC test and would be considered a good piece of evidence to use in this example.

2.1.3 Cross-Checking Evidence

CROSS-CHECKING EVIDENCE

✓ Using multiple sources of evidence strengthens an argument by adding support.

✓ The accuracy of evidence can be validated by finding similar information in multiple sources

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Display **Slide 12**. Explain to interns that in addition to using the ARC test to check individual pieces of evidence, they can also strengthen an argument by cross-checking evidence.

Cross-checking involves using multiple sources of evidence to add extra support to an

argument. In particular, the accuracy of evidence can be validated when multiple credible sources all contain the same or similar information.

2.2 Evaluating Reasons and Reasoning

EVALUATING REASONS AND REASONING

Reasons should be relevant to the claim in order to add weight to an argument. Reasoning should clearly link the evidence to the claim.

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Display **Slide 13**.

Explain to interns that reasons and reasoning are evaluated for their strength. **Reasons** should be relevant to a claim in order to add weight to an argument. **Reasoning** should clearly and logically link the evidence to the claim. Reasoning often explains *why* or *how* the evidence is relevant to the claim.

2.2.1 Evaluating Reasons

REASONS

LANGUAGE ARTS, SOCIAL STUDIES

REASONS

CLAIM ← Supports → EVIDENCE

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Display **Slide 14**, which shows a representation of how reasons are related to claims and evidence.

Inform interns that reasons and reasoning are used in similar ways, but in different domains.

Part 2. Evaluating Evidence and Reasons/Reasoning

In general, reasons are used to strengthen an argument in content areas such as language arts and social studies.

Explain that reasons should be directly relevant to a claim. The evidence should also relate to the reasons, so that there is a full link between the claim, reasons, and evidence.

STRONG AND WEAK REASONS

- ✓ A **weak reason** has little or nothing to do with the claim.
*It adds **little to no weight** to the argument.*
- ✓ A **strong reason** is closely connected to the claim.
*It adds a **lot of weight** to the argument.*

Display **Slide 15**.

Explain that **weak reasons** have little or nothing to do with the claim. They add little or no weight to an argument.

On the other hand, **strong reasons** are closely connected to the claim. They add a lot of weight to an argument.

EVALUATING REASONS

Weak Reason
Kids should go to bed early, because playing with an iPad is fun.

Strong Reason
Kids should go to bed early, because going to bed early is good for learning.

Display **Slide 16**, which shows examples of weak and strong reasons used to support the claim: “Kids should go to bed early.”

A weak reason might be: “because playing with an iPad is fun.” This may be true, but playing with an iPad is not related to whether or not

kids should go to bed early, so it is not a good reason.

A strong reason might be: “because going to bed early is good for learning.” Kids need to learn, so the idea that going to bed early helps them learn better is directly relevant to the claim, and thus this is a good reason.

2.2.2 Evaluating Reasoning

REASONING

MATHEMATICS, SCIENCE

REASONING

CLAIM ← Supports → EVIDENCE

Display **Slide 17**, which shows a similar representation to one on Slide 14.

Explain to interns that just as reasons are commonly used in argumentation in language arts and social studies, **reasoning** is commonly used in mathematics and science.

Reasoning shows how or why the evidence is relevant to the claim. Ideally, reasoning contains principles or concepts that can to explain exactly how the evidence is relevant to and supports the claim.

QUALITY OF REASONING

Weak Reasoning

- ✓ Lacks appropriate mathematical/scientific principles or concepts.
- ✓ Fails to connect the evidence to the claim.

Strong Reasoning

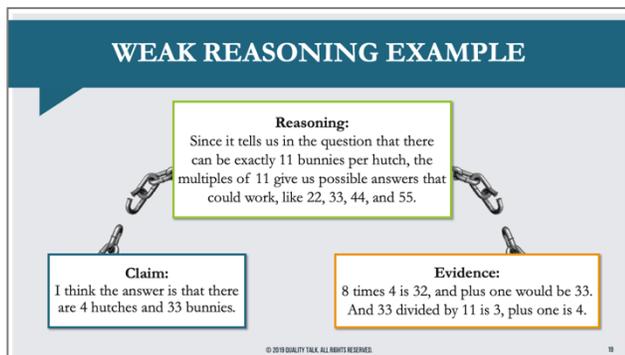
- ✓ Includes relevant mathematical/scientific principles or concepts.
- ✓ Explains how the evidence supports the claim.

Part 2. Evaluating Evidence and Reasons/Reasoning

Display **Slide 18**, which describes guidelines for considering the quality of reasoning.

In general, **weak reasoning** tends to lack the appropriate mathematical or scientific principles or concepts that are needed to show why the evidence supports the claim, and thus fails to connect the evidence to the claim. Point out to interns that in the graphic, the chains linking reasoning to the claim and evidence are broken, which also means that there is no connection between the claim and the evidence.

Strong reasoning uses relevant mathematical or scientific principles or concepts. These principals or concepts are then used to make logical connections that explain how the evidence supports the claim. Point out that, as shown in the graphic, strong reasoning leads to strong links between all three components of an argument: claim, evidence, and reasoning.



Display the example of weak reasoning on **Slide 19**.

Read the argument to the interns:

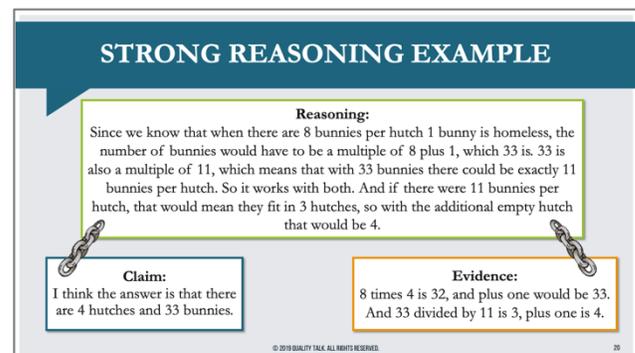
Claim: I think the answer is that there are 4 hutches and 33 bunnies.

Evidence: 8 times 4 is 32, and plus one would be 33. And 33 divided by 11 is 3, plus one is 4.

Reasoning: Since it tells us in the question that there can be exactly 11 bunnies per hutch, the multiple of 11 give us possible

answers that would work, like 22, 33, 44, and 55.

The reasoning above is considered weak reasoning because it does not explain how the calculations shown in the evidence lead to the claim that the answer is 4 hutches and 33 bunnies. Additionally, while it does mention the concept of multiples of 11, it talks about multiples that are irrelevant to the answer, and does not explain how the multiples of 8 are also important to the answer.



Display the example of strong reasoning on **Slide 20**.

Claim: I think the answer is that there are 4 hutches and 33 bunnies.

Evidence: 8 times 4 is 32, and plus one would be 33. And 33 divided by 11 is 3, plus one is 4.

Reasoning: Since we know that when there are 8 bunnies per hutch 1 bunny is homeless, the number of bunnies would have to be a multiple of 8 plus 1, which 33 is. 33 is also a multiple of 11, which means that with 33 bunnies there could be exactly 11 bunnies per hutch. So it works with both. And if there were 11 bunnies per hutch, that would mean they fit in 3 hutches, so with the additional empty hutch that would be 4.

This is considered strong reasoning because it directly links the calculations used as evidence

to the claim being made. Additionally, this reasoning does not just mention the concept of multiples, but directly explains how the number of bunnies in the answer comes from thinking about multiples of both 8 and 11. It further explains how that then leads to finding the number of hutches.

Part 3. Quality Talk in the Classroom

3.1 Evaluating Evidence and Reasons/Reasoning

EVALUATING EVIDENCE AND REASONS

Compare Evidence

✓ Practice with children by giving them multiple pieces of evidence or reasoning and asking them to evaluate which one is stronger.

Parents shouldn't limit screen time at home, because students can learn from using an iPad or computer.

Now that I am using my *Mathfacts* App, I can do my 8x multiplications in half the time that it took me in the beginning.

I saw the other class use iPads in class for learning.

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Display **Slide 22**, which provides an overview of how interns could teach their students about how to evaluate their evidence and reasons/reasoning.

Explain that students can be presented with multiple pieces of evidence or reasons to support the same claim and asked to evaluate which one makes a strong argument

As shown on the example slide, students could be presented with the claim and reason: “Parents shouldn’t limit screen time at home, because students can learn from using an iPad or computer.” They are then presented with two possible pieces of evidence:

- ◆ Now that I am using my *Mathfacts* App, I can do my 8x multiplications in half the time that it took me in the beginning.
- ◆ I saw the other class use iPads in class for learning.

Point out that while both pieces of evidence are relevant to the claim and reason, the first piece of evidence is stronger because it contains a specific example of how their learning improved. The second piece of evidence does not actually support the claim and reason because there is no evidence that the students in the other class are actually learning from their iPads.

3.2 Practice: Evaluating Evidence

LET'S PRACTICE!

✓ In pairs, generate two examples of evidence for each category.

✓ Where possible, try to list one example from CLE and one example from mathematics.

Texts

Calculations

Observations

Experts

Experience

Research

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Display the practice on **Slide 23**.

Remind interns of some of the sources of evidence. Inform them that they will be reflecting on the different types of evidence that can be used in different domains.

Using page 2 in their workbooks, instruct interns to work in pairs to generate two examples of evidence for each category. Where possible, they should try to list at least one example of evidence from mathematics and at least one other domain. Examples could include evidence they have used, evidence they have heard other interns in their group use, or evidence used by elementary students in their field experiences classrooms.

LET'S PRACTICE!

✓ In groups of 4, discuss your examples. Mark pieces of evidence that pass the ARC test.

✓ Then, compare and contrast the examples of evidence in mathematics and CLE.

Step 2: Compare and contrast the examples of evidence in mathematics and the examples of evidence in CLE you generated in step 1.

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Once interns have completed the first part of the activity, display **Slide 24**.

Have interns form groups of four (or place them in groups of four) and ask them to discuss the examples they listed. Have them mark pieces of evidence that pass the ARC test.

Then instruct interns to compare and contrast the examples of evidence in mathematics and other domains.

Finally, as a class, discuss the similarities and differences that interns identified between the two lists. Examples could include that calculations are common sources of evidence in mathematics, while they often use observations from their field experience classrooms during language arts discussions.