

Encouraging Use of High Quality Evidence



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The Learning
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THE
ARGUMENTATION
TOOLKIT

High Quality Evidence

Evidence is information about the natural world that is used to support a claim. In a scientific argument, evidence often consists of data, which can be measurements and observations.

- Data becomes evidence when it is used to support a claim.
- The quality of the evidence supporting a claim can be more important than the quantity.
- Quality of evidence depends on a variety of factors including reliability of the source and reproducibility.

Evidence Challenges

- It is hard for students to understand what makes something high quality evidence versus poor quality evidence.
- Students often use personal stories or anecdotes as evidence to support or refute claims.
- Students often assume that if their teacher provided the evidence, it must be of high quality.

Evidence Challenges Continued

- It is difficult to decide what to use as
- evidence when gathering evidence from a source such as a text.
 - Students are often uncomfortable evaluating evidence.

Ways to Encourage Use of High Quality Evidence

- Offer students opportunities to evaluate and organize evidence based on criteria such as source of the evidence.
- Give students opportunities to discuss and critique evidence and how evidence supports a claim with their peers.
- Provide students with evidence to use and discuss, but also offer activities where students gather their own evidence.

Ways to Encourage Use of High Quality Evidence

- Encourage students to look for evidence in text, simulations and visual representations.
- Discuss how quantity of evidence is different than quality of evidence.
- Don't discourage anecdotal or personal stories, but encourage students to share those and find additional evidence to support or refute claims.

Discussing with Evidence



The following slides provide examples of student's use of evidence in oral argumentation. There are also tips for how teachers might improve student's use of evidence.

Whole Class Share-out

Here we see a student use evidence from her observations of a hands-on investigation about density. This argument was made during a whole class share-out. A teacher may ask her to provide additional evidence to support her observations.

“The pink balloon is filled with cold water. My evidence is that it sunk to the bottom and I know that cold water sinks because it’s more dense and that means the molecules are closer together.” - 6th-grade student

Class Discussion

Here, in response to the teacher's question after a reading, this student explains why she thinks sweetener B did not provide as much energy as sweetener A. This was after a yeast investigation where students tested each sweetener. In this example, the student does not provide any evidence for supporting the claim that sweetener B didn't give the yeast as much energy. A teacher might next ask this student to provide evidence from the investigation or the reading.

“Because we think that cup B or sweetener B was more like sugar free or artificial sweeteners cause even though it was a sweetener it didn't give the yeast as much energy.” - 7th-grade student

Pair Discussion

Notice in this argument during a pair discussion about where hurricanes are likely to occur, the student provides some evidence from an article (the red part of the map showing where water temperatures are warm). A teacher might encourage this student to reference the actual water temperatures in the two locations and then describe how water temperatures influence hurricanes.

“The hurricanes occur, like hurricane Sandy, it was on the East Coast, and on the diagram it showed, remember it was really red and warm, and so that probably means, and like there’s never hurricanes here in California it seems like because the water’s so cold you know, and so it’s probably the reason why hurricanes only occur there is probably because the water is so warm.” - 6th-grade student

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Teacher-Student Discussion

In this argument about how mass and weight are different, this student is explaining how gravity affects weight and not mass, but he does not include any evidence from his observations. A teacher might next ask the student to explain what evidence he has from his observations to support the claim. In this case, the evidence comes from a simulation.

“The gravity pulls and pressures each object, and mass, well, just depends on how much stuff each object has and it will never change no matter what kind of gravitational pull it has.” - 6th-grade student

Writing With Evidence

The following slides provide examples of student's use of evidence in written argumentation. There are also tips for how teachers might improve student's use of evidence.



Gravity Argument

Question: How are the ball's weight and mass affected when dropped on different planets?

The ball's weight and mass are affected when dropped on different planets because of the gravity pull on that planet. The mass doesn't change when dropped on a different planet because the ball does not change. It doesn't get bigger or smaller. The only thing that changes the ball is its weight. Since the gravity is different on different planets, the weight of the ball changes from the weight on Earth. The ball drops a certain speed on Earth because of Earth's gravity. If the gravity changes the ball drop slower or faster than it did on Earth.

In this argument, the student is using science ideas to explain how weight is affected on different planets. This student does not include any of the evidence that was collected from a simulation showing what a 1 lb ball would weigh if dropped on different planets. A teacher might explain to this student that including the actual evidence collected would make this argument stronger.

Gravity Argument

Question: How are the ball's weight and mass affected when dropped on different planets?

The weight would change, but the mass couldn't. The weight would change depending on the gravitational pull of the planet or moon. The more mass the planet has the stronger the gravitational pull, as in Jupiter, being a gas giant, has 2.64 times more of a pull than Earth, causing a 1 pound Earth ball to be 2.64 lb. Though the weight changes the mass doesn't. It doesn't matter where you put that ball it will be made of the same items and have the same mass.

In this argument, the student includes both evidence and science ideas about gravity to explain how mass and weight are different. A teacher might tell this student that he could make his argument even stronger by referencing additional evidence that was collected.

A Scientific Argument About Rock in the Grand Canyon

Question: What type of rock is Zoroaster Granite?

Claim: The Zoroaster Granite can be Igneous because it has different colors and Minerals in the rock.

Evidence: It is Igneous because the granite is made up of many different rocks combined. And it can also be formed in many sizes.

In this argument, it is not clear if the student is providing evidence from his/her own observations of the rock or from a text or his/her own science knowledge. Additionally this student begins to provide some explanation in the claim, but does not connect the claim and evidence. A teacher might recommend that this student provide more evidence, being explicit about where the evidence is from and how the evidence supports the claim.

Summary



Evidence is information about the natural world used to support a claim. Teachers can develop student's understanding of high quality evidence through providing opportunities to evaluate, organize, discuss and critique evidence.



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