



Scientific Argumentation

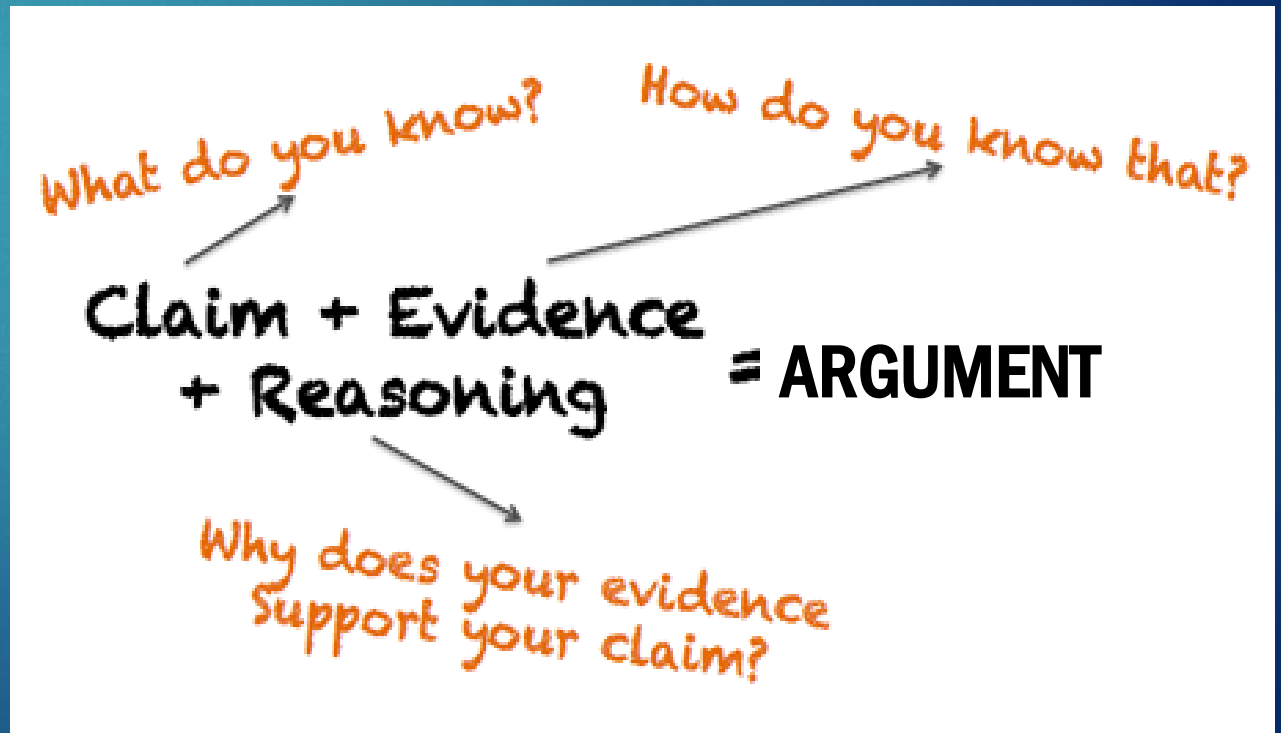
Why Scientists make Arguments

- ▶ Scientists make arguments to convince others what they believe is true.
- ▶ For example, one scientist might argue that global warming is happening and another scientist might argue that it is not.
- ▶ How do scientists make a good argument for what they believe?



3 Parts of a Scientific Argument

- ▶ A scientific argument has three parts:
 - ▶ Claim
 - ▶ Evidence
 - ▶ Reasoning



Claim

- ▶ A claim is a statement based on something you believe to be true.
- ▶ For example, should Mr. Smith be considered a good basketball player?
- ▶ Claim: Yes, Mr. Smith should be considered a good basketball player.



Evidence

- ▶ Scientific data that is appropriate and sufficient to support the claim.
- ▶ Evidence:
 - ▶ Mr. Smith likes basketball
 - ▶ Mr. Smith plays basketball every weekend
 - ▶ Mr. Smith is tall



Reasoning



- ▶ A justification that shows why the data counts as evidence to support the claim and includes appropriate scientific principles.
- ▶ Reasoning links the evidence and data to the claim.
- ▶ Reasoning
 - ▶ Mr. Smith must be a good basketball player because he plays basketball every weekend. Since practice helps someone get better at a sport, playing every weekend must make him good. Also, Mr. Smith is tall and most good basketball players are tall.

Is the evidence sufficient and appropriate to the claim?

- ▶ Think about the argument that Mr. Smith should be considered a good basketball player.
- ▶ Was the evidence used appropriate and sufficient to make that claim?
 - ▶ In other words, did the evidence used directly support the claim?
 - ▶ Is there other evidence that would be more appropriate?
 - ▶ Was there enough evidence to make that claim?
 - ▶ When is there enough evidence to support a claim?

Claim: Mr. Smith should be considered a good basketball player.

Evidence	Appropriate	Not appropriate
He likes basketball		
He plays basketball every weekend		
He is tall		
New evidence		

- When is there enough evidence to support the claim? In other words, when is the evidence sufficient to support the claim?
- Is some evidence more valuable than others?

How do you develop strong reasoning?

- ▶ Did the reasoning provide a link between the evidence and the claim?
- ▶ Did the reasoning use scientific principles or known rules as support?
- ▶ Answer these questions for the basketball reasoning:
 - ▶ Mr. Smith must be a good basketball player because he plays basketball every weekend. Since practice helps someone get better at a sport, playing every weekend must make him good. Also, Mr. Smith is tall and most good basketball players are tall.

Another example

► **Claim:**

When water freezes, it expands.

► **Evidence:**

A water bottle put in the freezer is larger

when you take it out. **Is this appropriate?**
Is this sufficient?

► **Reasoning:**

Does this link the evidence and the claim?

As the bottle stayed in the freezer the water molecules turned from liquid to solid. As they became a solid, they spread out. The bottle was bigger afterwards since the water inside of it expanded, it pushed the bottle outward.

Does this use scientific principles or known rules as support?

