Inference

forming a new conclusion based solely on what is already known

Objectives:
- understand that we can go beyond what is given to draw additional conclusions;
- recognize which inferences are plausible and which are not;
- understand the value of drawing inferences in a variety of circumstances.

targeted ✓
adaptable
Primary
Intermediate ✓
Middle ✓
Senior

Use the following activities to introduce the concept of inference

Introduce the term

➤ Introduce the term inference using one of the following activities:

- *Option 1:* Invite students to imagine they are detectives trying to find out as much as they can from the following e-mail message:

  Mary writes: *Jack, your new car is awesome.*

  Ask students to decide which of the following statements can be said to be definitely true, based on the information contained in this e-mail:

  1. Mary knows Jack.
  2. Mary has information about Jack's car.
  3. Mary has seen Jack's car.
  4. Mary is impressed by Jack's car.
  5. Mary believes that Jack hasn't had the car for a long time.
  6. Mary believes that Jack bought the car.

  (Only 2, 4, and 5 are necessarily implied by the e-mail message, although 1 and 3 are likely, and 6 is possible.)

- *Option 2:* One at a time, act out several ambiguous gestures (frown, reach into your pocket, shake or flap your hands rapidly) and utter a few words (Oh! What! Hmmmm). For each gesture or sound, ask students to try to figure out what you are doing, thinking, or feeling (for example, you might be shaking your hands to dry them or to shake off tension or stiffness).

➤ After discussing students' answers to the introductory activity, invite them to suggest a term to describe the idea that we can learn by thinking about the information we have been given. Introduce the word inference. Encourage students to explain its meaning in their own words. Point out that the root of this word means "to bring in or to introduce". Ask students to suggest other terms with similar meanings (for example, conclusion, implication).

Identify the attributes of the concept

➤ Using the activities that follow, introduce four basic attributes of inferences:

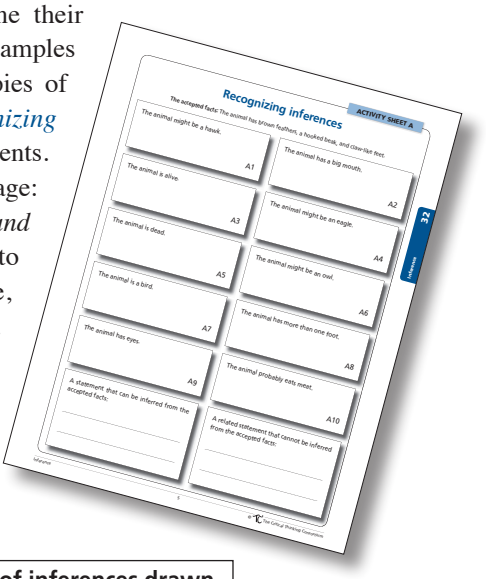
Basic attributes	#1) Inferences are conclusions based on what is already known.
	#2) Individuals may draw different inferences from the same source.
	#3) We are constantly drawing inferences from many different sources around us, including statements, observations, sounds, and images.
	#4) Some inferences may be more plausible than others.

Introduce attributes #1 and #2

Attribute #1 and #2: Inferences are conclusions based on what is already known. Individuals may draw different inferences from the same source.

➤ On the board, begin creating a web that will identify the attributes of inferences.

➤ Explain to students that they are going to refine their understanding of inferences by looking at various examples and non-examples of the concept. Distribute copies of the 12 cards (10 completed and 2 blank) in *Recognizing inferences* (Activity Sheet A) to groups of 2 or 3 students. Read the "accepted facts" stated on the top of the page: *The animal has brown feathers, a hooked beak, and claw-like feet*. Explain that students are to try to determine, if we knew that the accepted facts are true, what else might be concluded from this information. Instruct students to separate those cards containing examples of inferences that can be drawn from the accepted facts from those cards that are not examples of inferences that can be drawn from the accepted fact.



Examples of inferences drawn from the accepted facts	Not examples of inferences drawn from the accepted facts
A1	A2
A4	A3
A6	A5
A7	A9
A8	
A10	

➤ Review students' answers and the reasons for their conclusions. Draw attention to the need to base inferences entirely on the information contained in the accepted facts and the possibility that differing and competing inferences may be drawn (notably, the possibility that the animal may be an eagle, owl, or hawk). Ask students to complete the two blank cards by thinking of an inference that can be drawn from the accepted facts and one that cannot.

➤ Record the first and second attribute on the web.

Introduce attribute #3

Attribute #3: We are constantly drawing inferences from many different sources around us, including statements, observations, sounds, and images.

➤ Ask students to make a note of ten things (noises, images, objects, people) and to draw at least one inference from each source (for example, the condition of the desks in the classroom may suggest something about the age of the equipment and/or the level of student responsibility in caring for school property). Invite students to share some of their more imaginative or interesting inferences. Challenge students to identify an item in the classroom or elsewhere about which no inference might be drawn. Draw attention to our ongoing and unavoidable habit of drawing inferences based on what is presented to us.

➤ Add the third attribute to the web.

➤ As an extension, invite students to suggest at least one statement that is not a plausible inference that can be drawn from each of the sources used above (for example, we cannot decide whether the teachers are neat or messy from the condition of the students' desks).

Introduce attribute #4

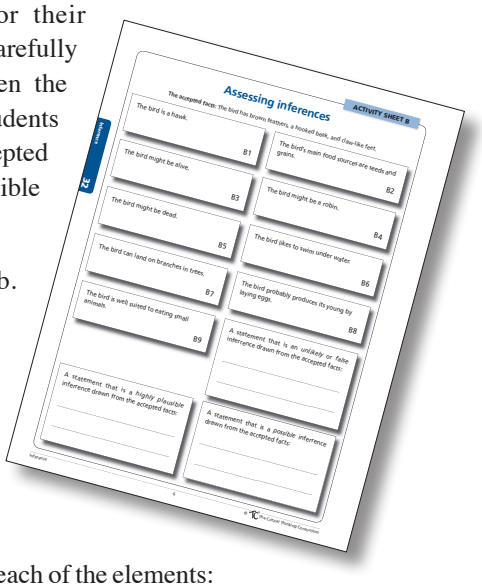
Attribute #4: Some inferences may be more plausible than others.

➤ Suggest to students that not every inference should be accepted as true—some inferences may only be possible and others may be completely false. Refer to a few of the questionable inferences suggested in the introductory activity described above (Do we know that Mary actually knows Jack? Were you trying to dry your hands when you shook them?) to help students see that inferences fall into three broad categories (these categories are really benchmarks along a continuum):

- highly plausible or highly likely— information in the accepted facts suggests the inference is most probably true;
- possible—the inference could easily be true or false; we can't tell given the accepted facts;
- unlikely or false—information in the accepted facts suggests the inference is most probably false.
- Distribute copies of the 12 cards (9 completed and 3 blank) in *Assessing inferences* (Activity Sheet B) to groups of 2 or 3 students. Read the "accepted facts" found on the top of the page: *The bird has brown feathers, a hooked beak, and claw-like feet*. Instruct students to separate the cards into the three categories described above.

Highly plausible	Possible	Unlikely or false
B7	B1	B2
B8	B3	B4
B9	B5	B6

➤ Review students' answers and the reasons for their conclusions. Draw attention to the need to think carefully whether the statement is likely true or not given the information contained in the accepted fact. Ask students to complete the three blank cards by using the accepted facts to think of a highly plausible inference, a possible inference, and an unlikely or false inference.



➤ On the board, record the fourth attribute on the web.

Reinforce the concept

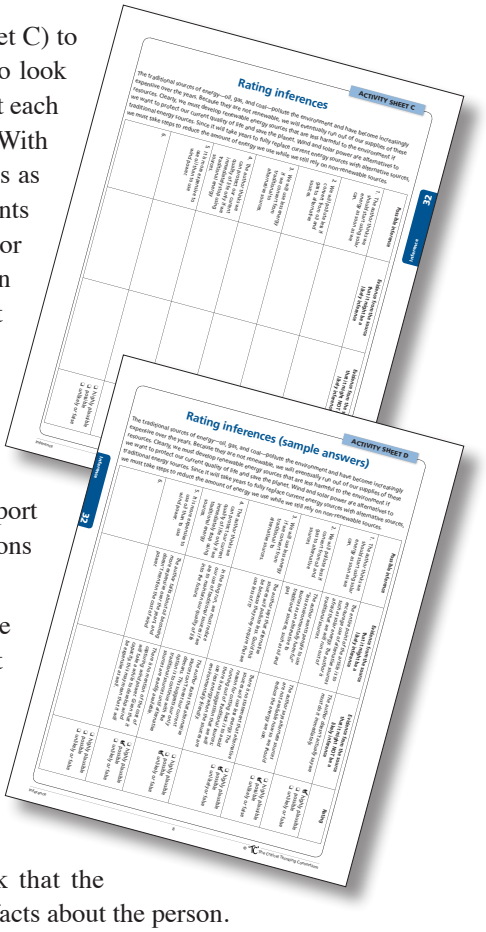
➤ Introduce the Student Resource, *Inference*. Review each of the elements:
the key attributes of the concept, reasons for thinking about the concept "inference,"
similar and different terminology and the self-assessment rubric. Help students create their own example for each attribute. Encourage students to refer to this resource when using the concept in the future.

➤ Review the following suggestions for assessing inferences drawn from a particular source:

- Check that you are clear about the meaning of all relevant details in the source.
- Think of several possible conclusions that might be drawn from these details or study the inferences that others have drawn from the source.
- Look carefully for evidence in the source to support each possible conclusion.

- Look for any evidence in the source or think of alternative interpretations that are not consistent with the inferences or that suggest a different inference is possible.
- Decide whether the proposed inferences are highly plausible, merely possible, or unlikely, given the information in the source.

➤ Distribute copies of *Rating inferences* (Activity Sheet C) to each student. Ask students to work with a partner to look for evidence in the paragraph to support or contradict each of the five possible inferences listed in the chart. With elementary students, complete the first few examples as a class. Based on the evidence in the text, ask students to rate the inference as highly plausible, possible, or unlikely. Review the suggested answers found on *Rating inferences (sample answers)* (Activity Sheet D). Invite students to think of their own inference and rate it based on the supporting and opposing evidence in the paragraph.



Apply the concept in everyday teaching

➤ At appropriate times over the ensuing several weeks, ask students to use this concept, with the support of Activity Sheet C, in regular classroom situations including the following:

- When listening to a presentation, question the inferences that the speaker has made in arriving at the conclusions in the presentation and consider the implications of the speaker's message beyond what is actually stated.
- When reaching conclusions about the actions or motives of peers or of fictional and non-fictional characters in literature, check that the interpretations are fully supported by the known facts about the person.
- When reading a text or examining images, develop a deeper understanding of material by looking for the messages that can be drawn beyond what is actually provided.

Assess student understanding

➤ Encourage students to refer to the rubric found in the Student Resource when self-assessing their understanding of this concept:

- Allow students opportunities to apply the concept two or three times without evaluation.
- Guide students in interpreting and using the rubrics to assess their own responses.
- Encourage students to use the rubric whenever they use this concept.

To use the rubric for teacher evaluation of student work, remove the first person (student) reference from each descriptor.

Recognizing inferences

The accepted facts: The animal has brown feathers, a hooked beak, and claw-like feet.

The animal might be a hawk.

A1

The animal has a big mouth.

A2

The animal is alive.

A3

The animal might be an eagle.

A4

The animal is dead.

A5

The animal might be an owl.

A6

The animal is a bird.

A7

The animal has more than one foot.

A8

The animal has eyes.

A9

The animal probably eats meat.

A10

A statement that can be inferred from the accepted facts:

_____

_____

A related statement that cannot be inferred from the accepted facts:

_____

_____

Assessing inferences

The accepted facts: The bird has brown feathers, a hooked beak, and claw-like feet.

The bird is a hawk.

B1

The bird's main food sources are seeds and grains.

B2

The bird might be alive.

B3

The bird might be a robin.

B4

The bird might be dead.

B5

The bird likes to swim under water.

B6

The bird can land on branches in trees.

B7

The bird probably produces its young by laying eggs.

B8

The bird is well suited to eating small animals.

B9

A statement that is an *unlikely* or *false* inference drawn from the accepted facts:

_____

_____

A statement that is a *highly plausible* inference drawn from the accepted facts:

_____

_____

A statement that is a *possible* inference drawn from the accepted facts:

_____

_____

Rating inferences

The traditional sources of energy—oil, gas, and coal—pollute the environment and have become increasingly expensive over the years. Because they are not renewable, we will eventually run out of our supplies of these resources. Clearly, we must develop renewable energy sources that are less harmful to the environment if we want to protect our current quality of life and save the planet. Wind and solar power are alternatives to traditional energy sources. Since it will take years to fully replace current energy sources with alternative sources, we must take steps to reduce the amount of energy we use while we still rely on non-renewable sources.

Possible inference	Evidence from the source that it might be a likely inference	Evidence from the source that it might NOT be a likely inference	Rating
1. The author thinks we should start using solar energy as soon as we can.			❑ highly plausible ❑ possible ❑ unlikely or false
2. We will pollute less if we convert from oil and gas to alternative sources.			❑ highly plausible ❑ possible ❑ unlikely or false
3. We will use less energy if we convert from traditional to alternative sources.			❑ highly plausible ❑ possible ❑ unlikely or false
4. The author thinks we can protect our current quality of life only if we immediately stop using traditional energy sources.			❑ highly plausible ❑ possible ❑ unlikely or false
5. It is more expensive to use oil than to use wind power.			❑ highly plausible ❑ possible ❑ unlikely or false
6.			❑ highly plausible ❑ possible ❑ unlikely or false

Rating inferences (sample answers)

The traditional sources of energy—oil, gas, and coal—pollute the environment and have become increasingly expensive over the years. Because they are not renewable, we will eventually run out of our supplies of these resources. Clearly, we must develop renewable energy sources that are less harmful to the environment if we want to protect our current quality of life and save the planet. Wind and solar power are alternatives to traditional energy sources. Since it will take years to fully replace current energy sources with alternative sources, we must take steps to reduce the amount of energy we use while we still rely on non-renewable sources.

Possible inference	Evidence from the source that it might be a likely inference	Evidence from the source that it might NOT be a likely inference	Rating
1. The author thinks we should start using solar energy as soon as we can.	*The entire point of the article is to encourage use of alternative sources such as solar energy. The author is afraid that we will run out of traditional sources.*	*The author doesn't actually say we must do it immediately.*	☑ highly plausible ☐ possible ☐ unlikely or false
2. We will pollute less if we convert from oil and gas to alternative sources.	*The author wants people to use "less environmentally harmful" sources as an alternative to traditional sources, such as oil and gas.*	*The author says alternative sources are not available now so we should reduce the energy we use.*	☐ highly plausible ☑ possible ☐ unlikely or false
3. We will use less energy if we convert from traditional to alternative sources.	*The author says that alternative sources will pollute less. Could this be because they may require that we use less of it?*	*There is no statement that alternative sources will use less energy. The reason for cutting back is to avoid running out of traditional sources; there is no suggestion that we will use less energy when the sources are environmentally friendly.*	☐ highly plausible ☑ possible ☐ unlikely or false
4. The author thinks we can protect our current quality of life only if we immediately stop using traditional energy sources.	*In the long run, we must reduce our use of traditional sources if we are to maintain our quality of life into the future.*	*The author states that alternative sources can't meet our current demands. This suggests our only option is to continue with the traditional sources until alternative sources are readily available.*	☐ highly plausible ☐ possible ☑ unlikely or false
5. It is more expensive to use oil than to use wind power.	*The author talks about oil becoming more expensive over the years, and doesn't mention the cost of wind power.*	*There is no mention of the cost of capturing wind power. Given that it will take a while to develop wind capacity, this may mean that it will be expensive as well.*	☐ highly plausible ☑ possible ☐ unlikely or false
6.			☐ highly plausible ☐ possible ☐ unlikely or false

Identifying and rating inferences

- Check that you are clear about the meaning of the details in the source.
- Think of several possible inferences that might be drawn from these details or study the inferences drawn by others.
- Look carefully for evidence in the source to support each possible conclusion.
- Look for any evidence in the source or think of alternative interpretations that are not consistent with the inferences or that suggest a different inference is possible.
- Decide whether the proposed inferences are highly believable, possible, or unlikely, given the information in the source.

Rating	Evidence from the source that it might NOT be a likely inference	Evidence from the source that it might be a likely inference	Possible inference
❑ highly plausible ❑ possible ❑ unlikely or false			
❑ highly plausible ❑ possible ❑ unlikely or false			
❑ highly plausible ❑ possible ❑ unlikely or false			
❑ highly plausible ❑ possible ❑ unlikely or false			
❑ highly plausible ❑ possible ❑ unlikely or false			
❑ highly plausible ❑ possible ❑ unlikely or false			

Inference

forming a new conclusion based solely on what is already known

What are the key attributes or features of the concept?

Basic attributes

- Inferences are conclusions based on what is already known.
  - EXAMPLE: If I turn off the sound when watching TV and try to figure out what is going on, I am drawing inferences from the details of the scene and the character's actions and gestures.
  - My own example:
- Individuals may draw different inferences from the same source.
  - EXAMPLE: One person watching two people yell at each other may think that they are fighting. Another person who sees and hears the same scene may conclude that the pair are simply poking fun at each other.
  - My own example:
- We are constantly drawing inferences from many different sources around us, including statements, observations sounds, and images.
  - EXAMPLE: Every time I look at a person or a picture of a person, I will likely form impressions about how old they are, whether they are happy or sad, and so on. Every time I look at an object, I may draw conclusions about whether it is expensive or cheap, made by hand or by machine, useful or largely for decoration.
  - My own example:
- Some inferences may be more plausible than others.
  - EXAMPLE: Two people who are yelling at each other may be fighting or simply poking fun at each other. However, if one of the individuals was crying, then it is more likely that they are fighting.
  - My own example:

Why is thinking about this concept important?

- ***Deeper understanding:*** Not all information is obviously stated. Looking for inferences helps us understand more fully what is happening in things we see, read and discover.
  Instead of ignoring what my friend is feeling when he/she makes confusing comments or gestures, I might look for clues to help me figure out what is going on.

  My own example:
- ***More careful:*** Realizing that we constantly draw inferences reminds us to check that the conclusions we reach are plausible.
  Instead of accepting my initial interpretation of a fight I had with a friend, I will think of other interpretations to see if any are as, or more, plausible.

  My own example:

What other terms are related to inference?

Similar terms

Conclusion
|
Implication

Confusing terms

Interpretation
When interpreting a picture, story or event we often go beyond drawing inferences from the information provided and speculate on what it means to us or why the situation is as it is.
|
Fact
Drawing an inference is not the same as finding out a fact—it is a matter of drawing conclusions from the facts.
|
Guess
An inference is more than a guess—it requires that we reason carefully about what is likely given the information provided to us.

How well do I understand the concept?

Assessing my understanding of "Inference"

Accomplished	Good	Basic	Struggling
Recognize examples of the concept:			
I can easily identify examples of an inference, including complex or difficult examples that require making sense of several pieces of information.	I can identify most examples of the concept, but I sometimes have trouble with the more complex or difficult examples.	I can identify obvious examples of the concept, but I often am confused by the complex or difficult examples.	I need help identifying even simple examples of the concept.
Explain whether the inference is plausible or not:			
I can clearly explain why a suggestion is or is not a plausible inference, even in complex or difficult situations.	I can clearly explain in most cases why a suggestion is or is not a plausible inference, but sometimes I am not sure.	I can explain in obvious cases why a suggestion is or is not a plausible inference, but I often have trouble explaining the complex or difficult examples.	I need help explaining why even a simple suggestion is or is not a plausible inference.
Provide my own examples of the concept:			
I can think of my own examples of inferences that are likely and unlikely, even in very complex situations.	I can think of my own examples of inferences that are likely and unlikely most of the time, but I have trouble thinking of examples in some complex or difficult situations.	I can think of my own examples of inferences that are likely and unlikely in simple or obvious situations.	I need help thinking of my own examples of inferences that are likely and unlikely, even in simple situations.