

Observation, Inference and Hypothesis

OBSERVATION: Is the gathering of information through the five senses (sight, sound, touch, smell, taste). This information can be in the form of:

- **Quantitative** information use numbers. It involves counting and measuring.
- **Qualitative** information use describing words. It involves observing and describing the observations through careful documentation.

INFERENCE: Using background knowledge and observation to reach a conclusion. An inference cannot be tested. It is based on interpreting information to make a statement. Some examples:

- Peter has 2 dogs, 4 cats and a bird cage full of native birds. From the observations just mentioned we can infer that Peter is a pet lover or a person selling animals illegally. But since we cannot question Peter this statement cannot be tested. It may also be that Peter has rescued animals trapped in a bushfire and is helping feed and house these animals.
- The grass on the school oval was observed to be dry and dying. It is turning yellow. We infer that the grass has not being watered for a long time. Our prior experience tells us that not watering the grass causes it to turn yellow and brown. So we conclude that the gardener did not water the grass over the holidays. The reason why the grass is dying however could be due to lack of water or in fact overwatering that can cause a fungal or insect infestation which has now past. Since we are reaching a conclusion based on prior knowledge and are unable to test our conclusion it is an inference.
- It is written that Roman Lord gave food and water to people stranded by the roadside. It can be inferred that he was a kind person, however it could also be that they were his slaves who were temporarily stranded. Since we cannot test this it is an inference.

HYPOTHESIS: Using observation and or background knowledge to predict the outcome about something that has not yet happened. Unlike an inference, a hypothesis can be tested. A hypothesis can be developed from an inference, based on observation that leads to a pattern and can never be proven, it can only be supported by evidence or rejected. A **hypothesis** based on the pattern is then made and tested. A hypothesis is sometimes, but not always, written in the form If then..... Because. Examples include:

- Lithium car batteries get better mileage than lead batteries. This can be tested and so can be written as a hypothesis. ***“if the lead car battery is replaced with a lithium battery then the car will increase its mileage because lithium batteries store more charge”***
- Plants that grow in nutrient rich soil grow faster and look healthier. This statement can also be tested and so can be written as a hypothesis ***“if the soil is fertilized with fertilizer then plants will grow at a faster rate because it is observed that plants in nutrient rich, black soil grow larger and appear to have greener leafs.”***

Complete the following by filling in the blank boxes using the words below and give a reason for your choice. *hypothesis, observation, inference.*

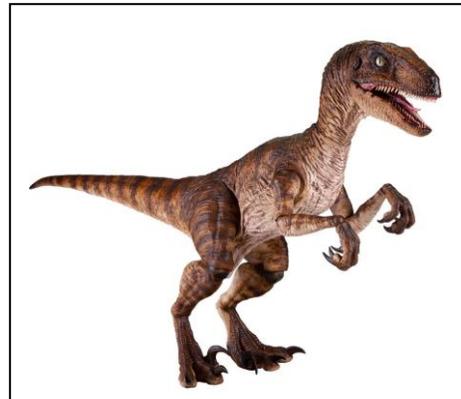
- 1) A nest of dinosaur eggs was unearthed with a velociraptor skeleton close by.
a) The nest had 22 eggs arranged in a circular manner with little bones clearly visible in some eggs.

Observation. Clearly scientists have identified that they were eggs due to the tiny skeletons visible in some of the eggs. This is both a qualitative and quantitative information. Quantitative because we can measure the number and size of the eggs and qualitative because we can describe what the nest looked like.



- b) The velociraptor looked after and protected its nest.

Inference. We have no proof that this actually was the case. If this was the only nest found, then it is plausible that the raptor may have been preying on the nest instead of protecting its own eggs.



- c) Velociraptors lived in a community.

Inference – we do not know if this was truly the case and cannot investigate it. If many nests are located and it appears that raptor skeletons were also found near the nests it may support the inference.

- d) One student was asked to give their hypothesis of the nature of velociraptors from the evidence unearthed. ***“If a velociraptor nest is discovered then a skeleton will also be found nearby because velociraptors were gentle caring parents that looked after their young and protected their nests.”*** Is this a plausible hypothesis? Explain.

No. This statement cannot be tested to see whether the raptors were caring or even protected their young as we cannot go back in time and observe their behaviour. Finding other nests with raptor skeletons nearby, however, may support the inference that these creatures preyed on eggs. If we can identify the eggs as been raptor eggs then it could support the inference that they were caring and protective of their nests.

e) In an area, close by, another nest was found with a similar nest formation and two skeletons of velociraptors. Does this support the hypothesis of the student in question d) above? Explain

No. The hypothesis states that they were gentle, caring parents. This cannot be tested. Assuming that the eggs can be identified as raptor eggs the inference that they looked after the nests is supported. Otherwise finding other nests with raptor skeletons nearby may support the inference that these creatures preyed on eggs of other species.

- 2) Whale bones were discovered on an isolated beach. Scientist believe healthy whales became disoriented and hence stranded themselves on the beach. Other scientists believe the whales were malnourished and lacked essential elements in their bones that eventually caused their death.



- a) The spine and several rib bones were found in a wind swept beach.

Observation. Qualitative information. Types of bones and location are mentioned.

- b) The bones were bleached and brittle.

Observation. Qualitative information. Colour and brittleness of bones is stated.

- c) The whales became stranded and disoriented and so beached themselves on this isolated beach. This is a phenomenon that happens regularly so it is likely that this is the cause.

Inference – Cannot be investigated as this is a one off event and trials cannot be conducted with this whale to see if it actually became disoriented. Prior knowledge is also used to make the inference.

- d) One scientist put forward a view that the death of the whale was due to poor health and strength in bone structure. Is this a plausible hypothesis? Explain.

Yes. This can actually be tested. The bones can be examined to calculate their mineral content and brittleness compared to similar bones from whales that have met with the same fate.

- e) Many more whale skeletons were found further down the beach with obvious signs of deformed bones. What does this finding suggest about the hypothesis?

It supports the hypothesis that the whale beached due to poor health.

- 3) Consider the picture on the right taken at 8 am. It is of a set of prints left in the sand by people and their pets walking by the beach. Identify the following statements as either observations, inferences or hypotheses. Give an explanation for your choice.



- a) There was one person and a dog walking on the beach at 8 am.

Inference. We can only observe two sets of prints, clearly made by a human and a dog. The time however we cannot clearly state and we are guessing judging by the number of people that may walk along the beach in the morning around this time.

- b) The dog was taken for a walk by its owner.

Inference. We do not know if the dog walked next to the person or came later or whether the dog belonged to the person who made the prints in the sand. This statement cannot be tested.

- c) Both the dog and the person walked in the same direction.

Inference. Although we can see that the tracks are pointing in the same direction we can only infer that the person and the dog walked in the same direction. For example, the dog could have walked on the beach and many minutes later the person came by and walked backwards parallel to the imprints left by the dog. Although it is highly unlikely it is still possible. Since we did not see this happen it is not an observation nor is it a hypothesis because it cannot be tested. Prior knowledge tells us that this is a reasonable inference to make.

- d) The dog walked next to its owner all the way along the beach.

Inference. This statement cannot be tested. It may be that the person or the dog made the tracks at different times. It is likely, however, judging by the way the tracks run parallel to each other that the pair walked together.