

## Views of Nature of Science

1. What is science?
2. What makes science (or a scientific discipline such as physics, biology, etc.) different from other subject/disciplines (art, history, philosophy, etc.)?
3. Scientists produce scientific knowledge. Do you think this knowledge may change in the future? Explain your answer and give an example.
4.
  - (a) How do scientists know that dinosaurs really existed? Explain your answer.
  - (b) How certain are scientists about the way dinosaurs looked? Explain your answer.
  - (c) Scientists agree that about 65 million years ago the dinosaurs became extinct (all died away). However, scientists disagree about what had caused this to happen. Why do you think they disagree even though they all have the same information?
  - (d) If a scientist wants to persuade other scientists of their theory of dinosaur extinction, what do they have to do to convince them? Explain your answer.
5. In order to predict the weather, weather persons collect different types of information. Often they produce computer models of different weather patterns. (a) Do you think weather persons are certain (sure) about the computer models of the weather patterns? (b) Why or why not?
6. The model of the inside of the Earth shows that the Earth is made up of layers called the crust, upper mantle, mantle, outer core and the inner core. Does the model of the layers of the Earth *exactly* represent how the inside of the Earth looks? Explain your answer.
7. Scientists try to find answers to their questions by doing investigations / experiments. Do you think that scientists use their imaginations and creativity when they do these investigations / experiments?
  - a. If NO, explain why.
  - b. If YES, in what part(s) of their investigations (planning, experimenting, making observations, analysis of data, interpretation, reporting results, etc.) do you think they use their imagination and creativity? Give examples if you can.
8. Is there a difference between a scientific theory and a scientific law? Illustrate your answer with an example.
9. After scientists have developed a scientific theory (e.g., atomic theory, evolution theory), does the theory ever change? Explain and give an example.
10. Is there a relationship between science, society, and cultural values? If so, how? If not, why not? Explain and provide examples.

## Views about Scientific Inquiry

11. A person interested in birds looked at hundreds of different types of birds who eat different types of food. He noticed that birds who eat similar types of food, tended to have similar shaped beaks. For example, birds that eat hard-shelled nuts have short, strong beaks, and birds that eat insects have long, slim beaks. He wondered if the shape of a bird's beak was related to the type of food the bird eats and he began to collect data to answer that question. He concluded that there is a relationship between beak shape and the type of food birds eat.

- (a) Do you consider this person's investigation to be scientific? Please explain why or why not.
- (b) Do you consider this person's investigation to be an experiment? Please explain why or why not.
- (c) Do you think that scientific investigations can follow more than one method?

If no, please explain why there is only one way to conduct a scientific investigation.

If yes, please describe two investigations that follow different methods, and explain how the methods differ and how they can still be considered scientific.

12. Two students are asked if scientific investigations must always begin with a scientific question. One of the students says "yes" while the other says "no". Whom do you agree with and why?
13. (a) If several scientists ask the *same question* and follow the *same procedures* to collect data, will they necessarily come to the *same conclusions*? Explain why or why not.  
(b) If several scientists ask the *same question* and follow *different procedures* to collect data, will they necessarily come to the same conclusions? Explain why or why not.
14. Please explain if "data" and "evidence" are different from one another.
15. Two teams of scientists were walking to their lab one day and they saw a car pulled over with a flat tire. They all wondered, "Are certain brands of tires more likely to get a flat?"

Team A went back to the lab and tested various tires' performance on one type of road surface.

Team B went back to the lab and tested one tire brand on three types of road surfaces.

Explain why one team's procedure is better than the other one.

16. The data table below shows the relationship between plant growth in a week and the number of minutes of light received each day.

Minutes of light each day	Plant growth-height (cm per week)
0	25
5	20
10	15
15	5
20	10
25	0

Given this data, explain which one of the following conclusions you agree with and why.

- a) Plants grow taller with **more** sunlight.
- b) Plants grow taller with **less** sunlight.
- c) The growth of plants is **unrelated** to sunlight.

17. The fossilized bones of a dinosaur have been found by a group of scientists. Two different arrangements for the skeleton are developed as shown below.

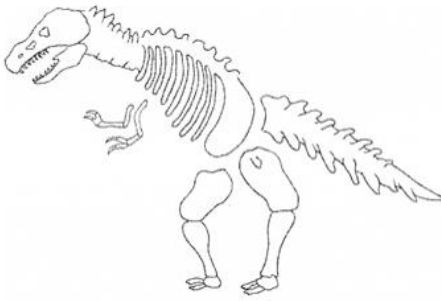


Figure 1

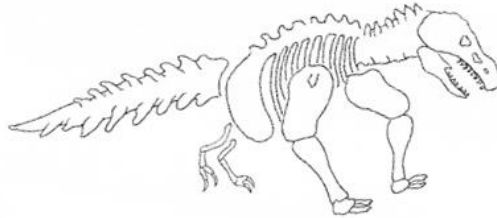


Figure 2

- (a) Describe at least two reasons why you think most of the scientists agree that the animal in *figure 1* had the best sorting and positioning of the bones?
- (b) Thinking about your answer to the question above, what types of information do scientists use to explain their conclusions?