

# SCOPE, SEQUENCE, and COORDINATION

A National Curriculum Project for High School Science Education

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# SCOPE, SEQUENCE, and COORDINATION

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## **Student Materials**

Learning Sequence Item:

# 903

## **Variations in Living Things**

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*Adapted by: Gerald Skoog and Tom Hinojosa*

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## Science as Inquiry

**A Group of Groceries****How much variation exists within a species?****Overview:**

Sometimes people say, “If you’ve seen one, you’ve seen them all.” Do all students in your class look the same? Do all peanuts look alike? How would you describe and/or measure the differences? In this activity you will make observations on one individual from amongst a large population to investigate variations that typically exist within a species.

**Procedure:**

Working alone, observe the specimen you are given so that you can identify it when it is placed in a container and mixed in with all the other specimens being observed by the class. Keep a record of characteristics that will help you identify your specimen.

Working in your group, measure one or more variables (mass, length, circumference, etc.) of the provided sample of 10 to 15 specimens. Graph your data. As instructed by the teacher, share your data with other groups and make a graph using the data from the entire class.

**Questions:**

1. What does the shape of the graph indicate about variation within the specimens?
2. Did the number of specimens in the sample influence the shape of the graph? If so, how?
3. Can you arrange your specimens to show a range in one factor or quality? For example, the students in your class could be arranged from shortest to tallest to show variation in height. Students could also be arranged by size of the foot or little finger (pinkie).
4. Would any of the variations you observed be an advantage in terms of the survival of that species? In other words, in terms of the survival of peanuts as a species, is there a particular kind of peanut that is better than the others? Explain your answer.

Science as Inquiry  
**Changing the Rules**

**What's the relationship between an organism's traits and its environment?**

**Overview:**

Most of the time a change or mutation in an organism is not helpful. However, sometimes the change makes the organism better suited to its environment. A change that increases an organism's chances of survival is called an adaptation. In this activity you will consider the relationships between the physical traits of organisms and their environment.

**Procedure:**

Read each rule below. Discuss with other members of your group the adaptive benefits the rule provides for that organism. Be sure to consider its normal niche and habitat. Record your ideas. Next consider the following changes to the "rules" of the natural world.

1. Rule. Male birds are more brightly colored than the females of the same species.  
Change. The coloration of all female birds is now brighter than that of male birds.
2. Rule. The gestation period of a lion is 108 days.  
Change. The gestation period of a lion is changed from 108 days to 216 days.
3. Rule. Grass is green.  
Change. Grass is now violet rather than green.
4. Rule. The human hand has four fingers and an "opposable" thumb.  
Change. The human hand grows an extra finger.
5. Rule. The California Condor has a wing span of over six feet (more than two meters).  
Change. The wing span is increased to more than twelve feet (more than four meters).
6. Rule. The elbow joint is a "hinge" joint.  
Change. The elbow joint changes from a hinged joint to a "ball-and-socket" joint (like the hip).
7. Rule. Rattle snakes have rattles on the end of their bodies.  
Change. The rattlesnake no longer has rattles.
8. Rule. Tigers live in India; Lions live in Africa.  
Change. Both tigers and lions now live in Australia.

**Questions:**

1. What do you think would happen if the change described actually occurred? What might be the consequences of that change? Would it be good for the species? How might the change affect other species in that environment?

2. Which suggested change would actually be the most "adaptive" for that organism in its natural habitat? Explain your reasoning. Be prepared to do a presentation with your group explaining your choice. Your teacher may ask you to prepare a poster or illustration explaining your choice as well.

## Science as Inquiry

**From Hamsters to Horses****Why is the gestation period different for different mammals?****Overview:**

Hamsters have more babies than horses do. Does this fact have something to do with the way each of these mammals live? The gestation period is the normal duration of pregnancy for a given species of mammal. In this activity, you will compare reproductive data for several species of mammals and consider their significance. You may find yourself wondering about how humans fit into these data!

**Procedure:**

Work in groups as directed by your teacher. Examine the data below showing average gestation period and average body weight for several mammals. Then rank order the animals on the basis of your estimation of the average number of young per pregnancy. For example, the rat has an average of seven young per pregnancy whereas sheep have an average of two. Rank order the animals from the largest average number of young at birth to the least.

Animal	Average Gestation Period in Days	Average Adult Body Weight in Grams
Hamster	16	100
House mouse	21	35
Rabbit	31	2,800
Lion	108	190,000
Tiger	109	209,000
Cow	284	500,000
Horse	336	500,000
Zebra	360	280,000
Bactrian camel	400	450,000
Black rhinoceros	540	764,000
Indian elephant	624	7,000,000

**Analyzing your results.** Discuss each of the questions below and come up with a thorough explanation for the data in the table. Write an essay that would include answers to all of the questions below.

**Questions**

1. Are there any similarities between the animals that have long gestation periods? What do they eat? Where do they live? Do they have dens or nests for their young? Is there any relationship between the number of young at one birth and the size of the adult animal? Is there any relationship between the number of young at one birth and the length of the gestation period, etc.?

2. Is there any relationship between length of gestation period and level of development of the young at birth? For example, are there differences at birth in terms of what a cat or a horse can do? If elephants had young that were blind, unable to walk, and basically underdeveloped at birth, how would that impact the way of life and survival rate of the species?

3. How does a short gestation period fit into the “life-style” of a carnivore? Why is a long gestation period a favorable adaptation for herbivores? How would you explain the short gestation periods and large litters of the hamster, mouse, and rabbit? In comparison with a camel, would you expect a leopard to have a longer or shorter gestation period?