Elementary Level Forward Exam Sample Question

Crafted by Kevin Anderson, DPI Science Education Consultant, based on work by DRC, the WI assessment vendor

- Aligned Content – NGSS DCI LS3.A, LS3.B, LS4.B, ESS2.D
- Aligned Science and Engineering Practices – Asking Questions, Modeling, Arguing with Evidence, Data Analysis, Creating Solutions
- Aligned Crosscutting Concepts – Patterns, Cause and Effect

How Does Your Garden Grow?

Armand tried some new vegetables at school and wants to grow a garden too. His mother helped him get a little land at the park on which is set aside for gardens. Armand asked his cousin Sara to help him out. They decided to work on it together for the summer.

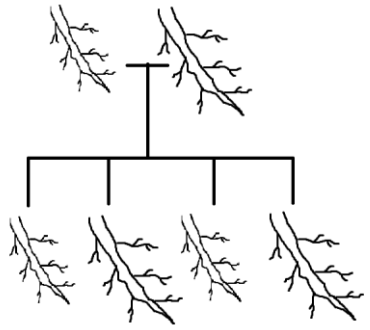
Before starting, they read a little bit about seeds. They found that most seeds you buy at the store are made to be all the same. There was no surprises in what the plants looked like. But, they found that they could buy “heirloom” seeds at a special garden store. These seeds came from a garden where the flowers were pollinated by bees with no special control on where the pollen came from to make new seeds. That way, the seeds could end up growing up into plants with more differences.

Usually, farmers want all their plants to be the same to help in taking care of them and to know that the fruit, grain or vegetables will be the same. In nature, plants end up looking more different over time. Sometimes new plants that grow work different in a way that helps them survive – like they do not need as much water. Or, their flowers look slightly different and bees like them more, so they are more likely to make new seeds.

Weather makes a difference in how well plants grow. Weather is measures of the atmosphere like temperature over a short period of time, such as what the temperature outside is today. The climate is measures of the atmosphere over a long time. Some plants grow better in different climates, such as places that get more rain or less rain on average over many years.

Question 1

This model of two generations of plants shows the **size of the roots** of the parent plants and the children plants (parents on top). Use it to answer the question below.



Which claim below is best supported by the evidence in this model?

a. The plants all have the same size roots.
b. The plants all have different size roots.
c. Some plants have the same size roots and some have different size roots.
d. You cannot tell which plants have bigger roots.

Question 2

Some plants survive better in certain conditions than others because they have different traits. Plants with deeper roots might have an advantage if there's a drought (long time with less precipitation), because they can reach water further underground. Use the patterns of weather shown in the table below to answer the question.

Average inches of precipitation per season in each year

Year	Winter	Spring	Summer	Fall
2014	5.2	6.4	4.3	3.8
2015	5.3	6.6	4.4	3.6
2016	5.2	6.3	4.1	3.8
2017	5.3	6.4	4.3	3.7

Based on this pattern in weather, would plants with deeper roots have an advantage?

Drop down menu 1: Yes/No (select one). Then, drop down menu 2: (a) There has been no major change in precipitation, so deeper roots won't help. (b) There is less precipitation in more recent years so deeper roots will help. (select one)

Question 3
The table below gives more detailed information about the weather this spring. Armand's first friend says the weather this spring **has been different** than usual. Armand's second friend says it **has been the same** as usual. Review the data and select who you think Armand should agree with and the best reason why that person's idea is supported by the data in the table.

	1970-1979	1980-1989	1990-1999	2000-2009	2010-Now	This spring
Inches of rain on average	5.5	6.1	5.9	6.1	6.5	6.4
Days with high temperatures above 70 on average	15	17	18	22	26	28

1) I think Armand should agree with his first friend because there have been more days with warm weather than any other set of years in the table.
2) I think Armand should agree with his second friend because the inches of rain have been similar to the recent average.
3) I think Armand should agree with his first friend because this spring the rain was 0.1 different than the most recent average.
4) I think Armand should agree with his second friend because this spring there have been about the same number of warm days as usual.

Question 4
When Armand and Sara planted their tomatoes, they used the same types of seeds for all of them from a package bought at the store. They noticed that the seeds planted in an area that got more shade resulted in plants that were taller, but had less tomatoes on them. Seeds planted in a sunnier spot resulted in plants that were shorter, but had more tomatoes. What research question could this data help them to answer?

1) Why does some soil make healthier plants than other soil?
2) What does a plant need to survive?
3) How does a sunny versus a shady environment affect tomato plants?
4) Will my tomatoes grow bigger in the sun or the shade?

Question 5
Armand and Sara put a fence around their garden to keep rabbits out. During the summer they find a rabbit in their garden though! It looks like the rabbit dug under the fence. They want to do some research on whether this is a behavior rabbits learn or if they inherited this trait. What source will likely give them the most accurate information?

1) A website that a student in another school made about rabbits.
2) A post about rabbits that they found on Facebook.
3) A book about rabbits from their library that was written in 2010.
4) A paper about rabbits that Armand's brother wrote when he was in Armand's grade.

Question 6

Armand and Sara decided to try to fix the problem of the rabbit getting in their garden. What are the **two** most important criteria for their design? [Criteria are the outcomes that show you have a successful design].

1) The plants do not get eaten by insects.
2) The plants grow more.
3) The rabbit does not get into the garden.
4) The soil is wetter.
5) The vegetables taste better.