

Some Background Concerning Life Science Content Standards for Fourth-Grade Teachers:

Adaptive Characteristics of Organisms

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Introduction

The background information for teachers in this document addresses the following life science content standards¹ for fourth-grade teachers:

3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:

b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

¹ As specified in *Science Framework for California Public Schools Kindergarten Through Grade Twelve*. Sacramento: California Department of Education, 2003, p 62.

Life Science Topic: Adaptive Characteristics of Organisms

Science Framework² for California Public Schools

Grade 4: Standard Set 3. Life Sciences: 2.b. *"Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all."*

"This standard is partly an extension of the study of adaptive characteristics of plants and animals that students may have encountered in grade three. All living organisms have biological requirements for growth and survival and can live only in environments to which they are well adapted. If an environment changes in a way that is harmful to an organism, the organism may not be able to survive. Adaptation is a genetic process that takes many generations to be perceived, so a single individual cannot "adapt" to a change. For example, the thick, blubbery skin of whales is an evolutionary adaptation to cold water. This adaptation is different from the types of changes that help a single individual survive, such as a change in seasonal diet or coloration, which are properly called accommodations."

Background for Teachers

Adaptive characteristics of each species of organism are commonly called *adaptations*.

**An adaptation
is an inherited characteristic
that allows an organism to both survive and
reproduce in its environment.**

How these adaptive characteristics came about is the subject of evolution³ (which most likely is not studied in fourth grade). What is important for teachers to remember is that adaptive characteristics arise over time (over thousands and thousands of years) within populations of a species, but do not arise within an individual.

² As specified in *Science Framework for California Public Schools Kindergarten Through Grade Twelve*. Sacramento: California Department of Education, 2003, p. 62.

³ The Theory of Evolution describes how species change over time (due to mutations and natural selection) and how new species arise (due to mutations, natural selection, geographic isolation and/or reproductive isolation).

Confusion about adaptation often occurs because, in common language, we use the word “adapting” to refer to a person acclimating to a situation (e.g., “adapting” to a noisy office). Individual organisms can sometimes acclimate to a situation, but these acclimations (accommodations) are not passed on to their offspring.

Example of Specialized Adaptation

Desert environments are hot, dry, and sunny. Plants that live in desert biomes have various adaptive characteristics that allow them to survive in hot/dry climates. These adaptive characteristics are inherited.

Cactus plants have special structures that allow them to thrive in deserts. For example, cacti do not have leaves (because leaves tend to lose water quickly); instead, cacti photosynthesize with their stems. The large stems of cacti have the ability to store water during rains for use during dry periods. These water-filled stems would be very tasty for thirsty desert animals; however, sharp thorns protect the cactus stems from being eaten. Figure 1 shows a prickly pear cactus.

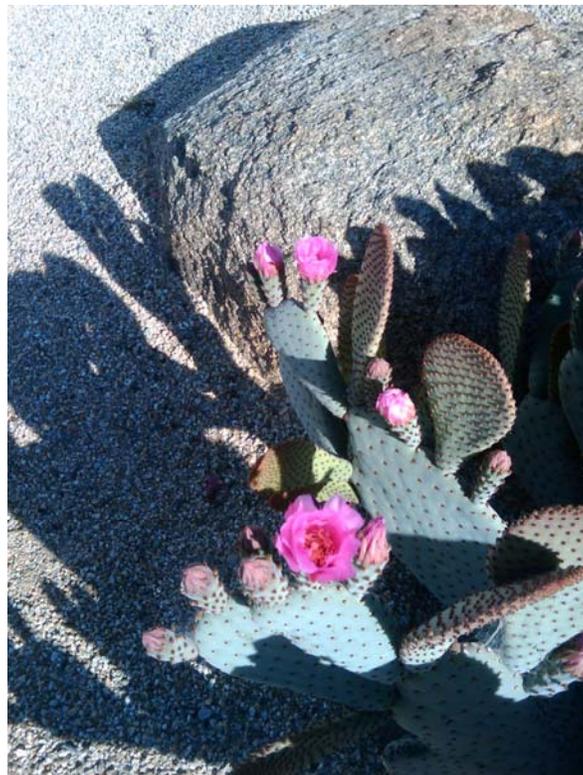


Figure 1. Photograph⁴ of a prickly pear cactus. This organism is adapted to life in a desert.

⁴ Photograph by Enright, J (2009) [1237936626438.jpg](http://pics.tech4learning.com). Pics4Learning. <http://pics.tech4learning.com>

Example of Restriction to a Particular Environment

Not only do adaptive characteristics allow an organism to survive in a particular environment, but adaptive characteristics also restrict the organism to that particular environment. For example, jellyfish live in saltwater; their bodies are perfectly adapted to life in the ocean. However, jellyfish cannot survive on land; their bodies collapse and dry up when they wash up on shore. The adaptive characteristics of jellyfish allow jellyfish to thrive in saltwater environments, but also restrict jellyfish to saltwater environments. Figure 2 shows some jellyfish in seawater.



Figure 2. Photograph⁵ of jellyfish. This organism is adapted to life in saltwater.

⁵ Photograph by Desandies, M (2006) [blackseanettles3.jpg](http://pics.tech4learning.com/blackseanettles3.jpg). Pics4Learning.
<http://pics.tech4learning.com>

Websites

1. Plant Adaptations

Missouri Botanical Gardens has a plant biology website with pages on plant adaptations as related to biomes.

<http://www.mbgnet.net/bioplants/adapt.html>

2. Animal Adaptations

Kidwings Educational Site has interactive activities about birds that were developed by an elementary school library media specialist in New York. The bird beaks pages show photographs of bird skulls, which you click on to find out more about what that bird eats and where it lives.

<http://www.kidwings.com/bodyparts/beaks/index.htm>

This fun educational website has interactive activities.

http://www.ecokids.ca/pub/eco_info/topics/climate/adaptations/index.cfm

3. Information on Evolution of Adaptations

Evolution is explained in simple terms in this New Hampshire educational website.

http://www.ecokids.ca/pub/eco_info/topics/climate/adaptations/index.cfm