

# How Offspring Resemble Their Parents: Relevant Phenomena for K-2 Students

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## Abstract

Much of science involves finding patterns in observations and explaining them in terms of a small number of principles or ideas. For students to appreciate how science works, they need to have a sense of the range of observations (phenomena) that are used to form the patterns and the helpfulness of the principles or ideas in explaining them. Project 2061's evaluations of science textbooks revealed that textbooks rarely engaged students with phenomena relevant to important science ideas, rarely included phenomena that directly address the often incorrect ideas that students may already have, and rarely guided students in reconciling phenomena with scientifically accepted ideas (Kesidou & Roseman, 2002; Stern & Roseman, 2004; American Association for the Advancement of Science [AAAS], 2002, 2005). In response to these deficiencies, Project 2061 and other CCMS researchers are identifying phenomena that could be used to support the teaching and learning of ideas recommended in *Benchmarks for Science Literacy* (AAAS, 1993) and in the *National Science Education Standards* (National Research Council, 1996).

This poster presents examples of phenomena that could be used to illustrate the K-2 idea that "living things are very much, but not exactly, like their parents and like one another" (*Benchmark 5B/P2*). This seemingly simple idea summarizes a wide range of phenomena that contribute to the recognition, in grades 3-5, that "for offspring to resemble their parents there must be a reliable way to transfer information from one generation to the next" (*Benchmark 5B/E2*) and, later, to the high school idea that "the information passed from parents to offspring is coded in DNA molecules" (*Benchmark 5B/H3*) (Roseman, Caldwell, Gogos, & Kurth, 2006). Without a firm grasp of these and other ideas, students will be unable to understand the science and significance of important discoveries such as those made possible by the Human Genome Project

(<http://www.project2061.org/publications/textbook/hbio/summary/genome.htm>).

## Key Idea

Offspring are very much, but not exactly, like their parents and like one another.

## What Students are Expected to Know

- Students should know that offspring resemble their parents and one another in external features and behaviors far more than they resemble offspring or parents of other species.
- Students should know that parents that have certain types of features do not have offspring with quite different types of features.
- Students should know that these generalizations apply to wild animals, domestic animals, and plants.

## Ideas Students Have

A review of the research literature is being completed and will document the most common ideas that students may already have about how organisms resemble their parents.

## Implications for Instruction

- Students should observe a wide variety of examples of offspring resembling their parents (and differing from offspring or parents of other species).
- Examples should clearly illustrate the point that the adult and young organisms are parent and offspring.
- To emphasize that this generalization applies to all types of organisms—not just to humans or pets—examples should include a variety of domestic animals, wild animals, and plants.

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### Limb Structures of Animal Offspring Resemble Those of Their Parents

- Photographs and/or video footage of animal species can be used to illustrate how the limb structures of the offspring resemble the limb structures of their parents and differ from the limb structures of other animal species.
- Students should observe that the digits of the young snowy owl resemble the digits of its parent, that the digits of a duckling resemble the digits of its parent, that the digits of the young snowy owl differ from the digits of a duck, and that the digits of the young duckling also differ from the digits of the snowy owl.
- Students will need to infer that the young organisms observed are the actual offspring of the adults shown, since the examples do not provide evidence of parenthood.
- For K-2 students, the discussion should focus only on external features.
- In selecting other examples, stick to species where the external features of the young are similar to those of the parent, such as with species of birds and mammals.



### Coloration Patterns of Offspring of Wild Animals Often Resemble Those of One Another and Those of their Parents

- Photographs or video footage of family groups of various animal species can be used to illustrate their differing coloration patterns.
- Students should observe that a young zebra has a pattern of black and white stripes that resembles that of its parent; that a young gazelle's white belly, tan back, and black stripes resemble that of its parent; that the young zebra does not have a white belly and tan back; and that the young gazelle does not have black and white stripes.
- The gazelle and zebra examples show the young nursing, providing some evidence that the two organisms are parent/offspring.
- In selecting other examples, hold off on using (a) animal species (such as deer) where the young do not have adult coloration for several years, (b) examples of domestic animals (such as cats) in which coloration patterns vary from one offspring to another, and (c) organisms of different gender (such as male and female pheasants). After students understand the life cycles of some organisms, they will realize that (a) it may take time for the offspring to grow up and resemble its parent, that (b) there is more variation in some features of pets than in wild animals, and that (c) organisms grow up to resemble the parent of their gender.



### Behavioral Traits of Offspring Resemble Those of Their Parents

- Photographs or video footage of purebred dogs and their offspring can be used to illustrate behavioral traits that are transmitted to offspring.
- Students should observe that a young pointer dog has assumed the characteristic motionless stance of its parent, even prior to any training.
- To broaden the range of examples, students can research behaviors of other dog breeds, identifying evidence that the young exhibit aspects of these behaviors prior to training.



### Plant Seedlings Resemble Their Parents and One Another as Compared to Plants of Other Species

- Photographs of stages in the life cycle of various plants can be used to illustrate that plant offspring also resemble their parents and differ from plants of other species.
- Students should observe that the young impatiens plant resembles the adult impatiens; that the young bean plant resembles the adult bean plant; that the young impatiens plant differs from the bean plant; and that the young bean plant differs from the impatiens.
- To provide evidence that one organism is the offspring of another, students should grow plants of different species, collect and plant their seeds, and follow the growth of the next generation of plants to observe directly that plant offspring resemble their parents and differ from plants of other species.
- In selecting other examples, stick to species that mature rapidly and have easily detectable differences between species and avoid using hybrid plants, where the offspring may differ significantly from the parents.



<http://www.biocourse.heacademy.ac.uk/.../beej-1-3.htm>



<http://www.whitepostfarms.com/fieldtrips-gallery.htm>

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