Wizards of Wright

Lesson: Artificial Selection

Background Info for Wizards:	Biotechnology is the science of changing nature to better human lives. Artificial Selection is one of the earliest forms of Biotechnology. With artificial selection, biotechnology engineers breed plants or animals to enhance desirable traits.
Materials:	15 bags of 110 beans (1 bag per group) 15 rulers (1 per group) 15 cups labeled "discarded beans" (1 per group) 15 calculators (1 per group) 30 Artificial Selection worksheets (1 per student)
Lesson Time: ***50 minutes***	Introduction: 5 minutes Guided Lesson #1: 10 minutes Student Activity: 30 minutes Conclusion: 5 minutes
Learning Targets:	Students will understand the term artificial selection and how it relates to the field of Biotechnology. Students will learn the difference between natural and artificial selection. Students will become biotechnology engineers and "breed" the best bean for human consumption.
Introduction for Students: 5 minutes	**Ask students:** Has anyone hear of Biotechnology? Can anyone explain what it is? - Biotechnology is the field of science that is focused on changing nature to make human lives better. - Biotechnology takes the work of life science and applies it to create real-world solutions to problems. **Say to the students:** Let me give you some examples of how this brand of science is changing our world. - Biotechnology uses living organisms and molecular biology to produce all kinds of products and therapeutics to enhance human life.

	- It has played an important role in the fields of medicine and pharmaceuticals (vaccines, medicinal improvements, cloning, DNA sequencing, gene splicing), as well as food production (lactose free milk, genetically modified foods, pest resistant crops), and the production of biofuels.
Guided Lesson #1: 10 minutes	**Say to the students:** Today we will focus on artificial selection. Can anyone explain what artificial selection is? Can anyone contrast it to natural selection? - Artificial selection is the identification by humans of desirable traits in plants and animals, and the steps taken to enhance and continue those traits in future generations. - Artificial selection works the same way as natural selection, except that with natural selection it is nature, not human interference, that makes these decisions. **Say to the students:** Let me explain the difference between the two. Natural selection is sometimes summed up by the phrase "survival of the fittest". In nature, organisms produce more offspring than can survive and reproduce. Offspring with traits that make them more likely to survive, mature, and reproduce in the environment they inhabit pass on their traits to the next generation. Organisms therefore gradually become better-suited for their environment. If the environment changes, natural selection will then push organisms to evolve in a different direction to adapt to their new circumstances. For example, there are birds with a type of beak that has evolved for a specific task. Where there is a large supply of seeds on the ground, for instance, short-beaked birds became more common, because these beaks are better at cracking open the seeds. Where cactus plants are more common, birds with long, narrow beaks to extract pollen and nectar from cactus flowers are more common. Artificial Selection is one of the oldest forms of biotechnology. Over 6,000 years ago, humans discovered that they could slowly change plants and animals to feed villages. Also, artificial selection was used to breed animals to do work or provide companionship. Artificial selection has long been used in agriculture to produce animals and crops with desirable traits. Many of the meats, fruits, and vegetables sold today are the result of selective breeding and artificial selection.

	Dog breeding is another prime example of artificial selection. Although all dogs are descendants of the wolf, the use of artificial selection has allowed humans to drastically alter the appearance of dogs. For centuries, dogs have been bred for various desired characteristics, like having shorter legs and smaller bodies so that they eventually became a small breed of dog. Artificial selection appeals to humans since it is faster than natural selection and allows humans to mold organisms to their needs.
Student Activity: 30 minutes	**(Students will be working in pairs for this activity. Ask the teacher if the pairs have already been created. If not, wait while he or she does this.)** Pass out to each pair: - 1 bag of 110 beans - a cup labeled "Discarded Beans" - a ruler - a calculator Pass out an Artificial Selection worksheet to each student. **Say to the students:** You are now biotechnology engineers. Your job today is to create a bigger, better bean for humans to eat. Explain to the students that all the information they will need are on these sheets, and that they will be working through an activity on Artificial Selection with their partner. Allow the pairs time to follow the directions and work through the tasks. Roam around as they are working, answer questions, and help them with any part they may be struggling with. Once the numbers are all recorded, you may begin processing the information with the students. Call on a few groups to have them give out the measurement of their largest bean and final average size of those beans. Call on a few more groups to ask if their bean sizes increased as the "breeding" went on. The answer should be yes, but you may have a few groups that did not "breed" for bean size. Express that the bean breeding program was a success and that larger beans will soon be available! Have the groups carefully put all of their beans back into the bag and collect all supplies.

Conclusion: 5 minutes	Review with students what was covered today? Ask students to explain the following terms: - biotechnology (Can anyone can name 1 improvement to our human lives made possible through biotechnology.) - artificial selection - natural selection - selective breeding **Ask the students:** What factors made our bean breeding program a success? Answers should include we were picking out the largest beans or we were breeding only the best beans.

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