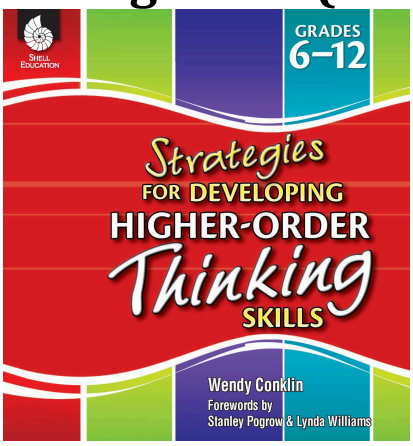
SHELL EDUCATION

Sample Pages from

Strategies for Developing Higher-Order Thinking Skills (6–12)



The following sample pages are included in this download:

- Table of Contents
- Creative Thinking Strategy excerpt
- Sample chapter selection

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Creative Dramatics Overview

Creative dramatics is a form of imaginary play that does not use written dialogue. Students create their own actions and words to show what they know about something. It relies on the students' willingness to act out scenarios and is often described as structured, goal-oriented play. When students act, the teacher can assess how well students know the content while also reinforcing the concepts for students who are participating and watching.

Creative dramatics fully utilizes higher-order thinking skills because students interpret, organize, and synthesize ideas (Block 1997; Cox 1983; Froese 1996; Harp 1988; Miller and Mason 1983). It involves active learning experiences by engaging and stimulating students' imagination while also using play and imagination to help students process the world of reason (Block 1997; Froese 1996; Kelner 1993). Creative dramatics is also physical and emotional, so students are more likely to learn and remember the concepts (Block 1997; Bolton 1979). Another benefit is that student comprehension of texts and understanding of material increases as a result of participating in activities that utilize creative dramatics (Block 1997; Harp 1988; Henderson and Shanker 1978; Miller and Mason 1983; Wagner 1988). Creative dramatics is a tool that promotes vocabulary and language growth, which supports new language-learner populations (Block 1997; Edwards 1997; Froese 1996; Heinig 1993; Kelner 1993).

Creative dramatics involves four basic elements: structure by modeling and sharing expectations, open-ended scenarios that are improvisational in performance, a safe environment so students can express themselves freely, and positive teacher/student feedback (Johnson 1998).

To focus on the four elements of voice, how students use their bodies, characterization, and how well they work in groups, teachers can have students practice by using the following activities in isolation:

Voice—Provide a sentence and have students say it using different emotions, such as *painful*, *happy*, *surprised*, *nervous*, *angry*, or *jealous*. Teachers can take popular lines from stories, movies, commercials, or key vocabulary words and try this exercise.

How students use their bodies—Have students act out various scenarios with an emphasis on how their body would move in a particular situation. Possible scenarios might include seeing a lion in the classroom, winning an award, or acting like a dictator.

Characterization—Have students act as if they were famous people, book characters, important scientists or mathematicians, historical figures, numbers in an equation, etc.

Group work—Teachers can remind students to be on the lookout for others who work well in groups. Do they include ideas from others? Are they respectful? Do they get their work done?

Genetically Altered Unicorns

Higher-Order Thinking Skill

- Project-Based Learning

Standards

- Students will know that hereditary information is contained in genes, each of which carries a single unit of information; an inherited trait of an individual can be determined by either one or many genes, and a single gene can influence more than one trait (McREL 4.4)
- Students will use appropriate learning strategies to construct and apply academic knowledge (TESOL 2.3)

Materials

- *Background Information* (pages 253–254)
- *Unicorn Chromosome Strips* (page 255)
- Scissors
- *Unicorn Key* (page 256)
- *Genetic Engineering Projects* (page 257)

Procedures

1. Tell students that back in 2009, a few doctors announced that they could genetically engineer a baby. Explain that this means these doctors can control the gender, hair color, eye color, and skin color of a baby. It also means that doctors can identify dozens of genes that cause diseases like cancer. The ability to genetically engineer a baby came about because scientists were able to map out the human genome. Mapping the human genome helps them understand the three billion letters that make up people's genetic codes.
2. Distribute copies to students of the *Background Information* activity sheets (pages 253–254) and have students read it silently.

English Language Support

Meet with these learners and read the background pages in a small group setting to ensure comprehension.

3. Write the following question on the board: *Does genetic engineering eliminate the variability that makes us human?* If desired, allow students to give an initial response to this question.

Genetically Altered Unicorns *(cont.)*

Procedures *(cont.)*

4. Read the following scenario to students: *Your class has just been given two unicorns! You are in luck because the unicorn's genetics is very similar to that of humans. Your class needs to develop a herd of unicorns for scientific study at a medical school. The purpose of this activity is to determine what kinds of unicorns you will have in your herd when your two unicorns mate. Interestingly, unicorns make good tools for the investigation of meiosis. You will "create" baby unicorns given genotypes that you determine by selecting paper chromosomes.*
5. Have students find a partner. Distribute a copy of the *Unicorn Chromosome Strips* activity sheet (page 255) to each set of partners. Instruct students to cut apart the chromosome strips, keeping the female and the male strips in separate piles. Students should place the chromosome strips face down in the same order as the strips were before being cut out (shortest strips at the top and longest strips at the bottom).
6. One partner will go first by taking one of the longer chromosome strips from the female pile and one of the longer chromosome strips from the male pile to make a set. The other partner takes the two longest chromosome strips that are left over in the pile to make a set. Have students repeat this process until all the chromosome strips have been taken from the piles and each partner has seven sets of chromosomes.
7. Have students turn over their chromosome sets to reveal the baby unicorns. Distribute copies to students of the *Unicorn Key* activity sheet (page 256) and have students discover what traits their baby unicorns possess. Students should notice that they have both capital letters and lowercase letters in their piles. Tell students to find out the genotype by combining the two letters. Explain that the capital letters stand for dominant genes and the lowercase letters stand for recessive genes. Dominant genes must have at least one dominant gene. Recessive genes contain 2 recessive genes only. Students should then be able to determine the phenotype for each characteristic using the key.
8. Once students have the characteristics of their baby unicorns, they should draw a picture of that unicorn along with a scenario to show his or her powers according to the phenotype AA, Aa, or aa.

Genetically Altered Unicorns *(cont.)*

Procedures *(cont.)*

9. Display students' illustrations around the room and let students look at them. Then talk about what traits were more desirable than other traits in unicorns. Make a list of these traits on the board.

10. Ask the beginning question again relating it to the unicorns: *Does genetic engineering eliminate the variability of unicorns?* Discuss this as a class. Then, discuss it again in relation to humans.

11. Tell students that they will be selecting projects to work on outside of class. Distribute copies to students of the *Genetic Engineering Projects* activity sheet (page 257) and read through the choices as a class. Set a due date and have students write it on their papers.

Differentiation Tip

You can allow your struggling students to work with partners for the completion of their projects if necessary.

12. On the day the projects are due, allow students to present their projects to the class. Then, have a final discussion using the question you began the lesson with: *Does genetic engineering eliminate the variability that makes us human?*

13. If desired, you can use the following extension discussion topics with your class. Be aware that some of these topics are considered controversial.

- Where will technology stop when parents want to prevent baldness, shortness, below average intellect, curly hair, beauty?
- Should we alter the genes of a developing fetus to create a custom-made baby?
- Why do some parents choose to genetically alter their babies?
- Do the benefits of new genetic tools outweigh the risks?

Assessment

Assign students to two projects to write brief (1 paragraph long) peer evaluations. Assess student work using these peer evaluation paragraphs as well as assessing those who wrote the evaluations on their thoughtful comments.

Name:_____ Date:_____

Background Information

Directions: Read the information below.

Reproduction

When you cut your finger, your body generates new skin to close the wound. Skin cells undergo a process called *mitosis* to create new skin. Exact copies of existing skin cells are created to replace the ones destroyed by the cut. Growing new cells is called cell division or asexual reproduction.

But how do organisms create new offspring? How do all the kinds of cells that go together to make one organism get reproduced? How do a mother cat's cells know to grow a kitten and not a puppy? *Meiosis*, or sexual reproduction, is the process that organisms undergo to reproduce.

Gametes

Meiosis is the division of special kinds of cells. It is also called *sexual reproduction*. Unlike mitosis, meiosis produces four special cells called *gametes*. You can think of gametes as half-cells: each daughter cell contains half the DNA from the parent cell. DNA is a molecule encoded with instructions for cell operation. It is transmitted through chromosomes.

There are many organisms that have cells that undergo meiosis. Animals, seaweed, fungi, and plants all use this process. Meiosis makes human egg cells in females and sperm cells in males. Flowering plants undergo meiosis. Meiosis makes megaspore cells in the flower's ovaries. It makes microspore cells in the stamens.

Meiosis happens in two stages called *Meiosis I* and *Meiosis II*. Both stages look a lot like mitosis, which splits one cell into two. At the end of Meiosis I, the original cell has split into two cells. Both cells have DNA, but not all of it. Each cell has two copies of half the original DNA. Later, Meiosis II will split the two full cells into four half-cell gametes, each with one copy of half the original DNA.

What good are gametes with only half-sets of DNA? In animals, a female's gametes are egg cells and a male's gametes are sperm cells. When they combine, together they have a complete and unique set of DNA. The set has some chromosomes from both the father and the mother.

One of a Kind

The cell has a completely new and unique set of DNA, and the potential to be a whole new organism. However, only one cell is not much of a new organism. In order to get larger, it creates new cells, and to do this it turns to a different tool: asexual reproduction. It uses mitosis to split into two cells, then four, then eight, and over time, the collection of cells grows into a new organism. It will have some traits from its father and some traits from its mother. It will be their child.

Mitosis and meiosis work together and depend on one another. Mitosis helps organisms grow new cells and repair damaged cells within themselves. Meiosis helps them produce whole new organisms that are their offspring.

Background Information *(cont.)*

Genetics

A baby's cells works a lot like its parents' cells: blond parents often have blond children. Whole families all have the same kind of nose or shoulders. How do they all get similar instructions? In 1903, Walter Sutton developed the Chromosome Theory of Inheritance. It said that parents pass chromosomes to their offspring.

Chromosomes

Every human cell has 23 pairs of chromosomes, which gives each cell 46 in all. Chromosomes are made up of alleles, which are instructions for cells. Each one has more than 2,000 alleles along its length. Because chromosomes come in pairs, alleles come in pairs, too. Every human cell has two sets of instructions for everything, and those paired alleles work together to make a gene.

A zebra's genes give it camouflage stripes; an albatross's genes give it wings. Our genes give us fingers and everything else that makes us human. Camouflage, wings, and fingers are all traits, and those traits start in the cells. Each cell follows its instructions on how to develop, function, and behave, and all those cells work together to make camouflage or wings or fingers.

A normal cell contains a full set of chromosomes: 23 pairs. Each pair has one chromosome contributed by the mother and one contributed by the father. If both the father and the mother were blond, the chromosomes they contribute to the baby would include blond alleles. The baby would be blond.

Sometimes the mother and father do not have the same alleles. Then the baby gets chromosomes with different alleles on them. The father's chromosome may have the attached earlobe allele while the mother's chromosome may have the hanging earlobe allele. The baby's cells follow both sets of instructions at the same time. What kind of earlobes will the baby have?

Dominant and Recessive

Some alleles are dominant, while others are recessive. If a dominant allele is present, that trait will show up. So, if two dominant alleles are present, the dominant trait will show up. When one dominant and one recessive allele are present, the dominant allele will still show up. However, if two recessive alleles are present, the recessive trait will show up.

Alleles are passed down over generations. The father may have two recessive alleles for attached earlobes. He would have attached earlobes. The mother may have gotten a dominant allele for hanging earlobes and a recessive allele for attached earlobes. She would have hanging earlobes.

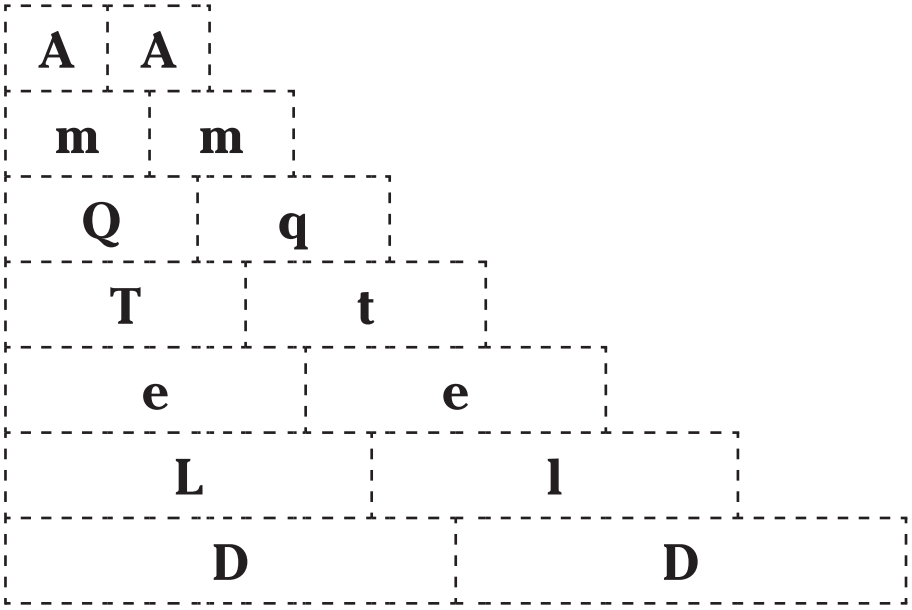
The baby would get one of the father's recessive alleles. The baby would get one of the mother's alleles, too. If the baby got the dominant allele, it would have hanging earlobes. If the baby got the recessive allele, it would have attached earlobes.

Name:_____ Date:_____

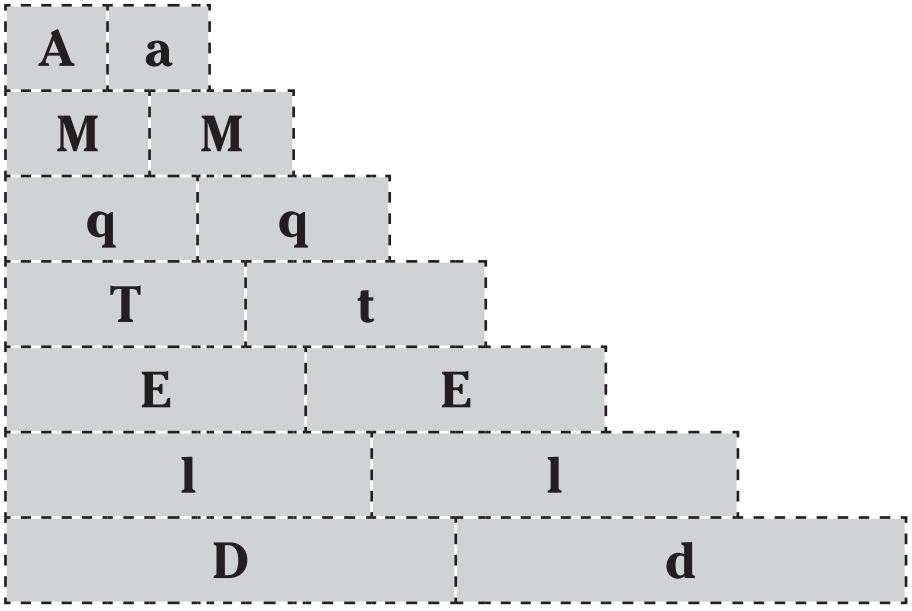
Unicorn Chromosome Strips

Directions: Cut apart the strips below and place them face down in order on a table. Keep the male's chromosomes separate from the female's chromosomes. The female's chromosomes are shaded.

Male Unicorn Chromosome Strips



Female Unicorn Chromosome Strips



Name:_____ Date:_____

Unicorn Key

Directions: Use the key below to discover what traits your baby unicorns possess.

Genotype	Phenotype
AA or Aa	Can heal wounds, but unreliable
aa	Can purify toxic food/drink
MM or Mm	Bifurcated hooves
mm	Non-bifurcated hooves
QQ or Qq	Large size
qq	Miniature size
TT or Tt	white body
tt	purple body
EE or Ee	pink hair (mane/tail)
ee	white hair (mane/tail)
LL or Ll	solid white horn
ll	rainbow horn
DD or Dd	short haired
dd	long haired

Name:_____ Date:_____

Genetic Engineering Projects

Directions: Select at least one project to complete from the list below.

Due date: _____

Project selected: _____

1. Watch the movie *Jurassic Park* from 1993. Investigate to find out if it is possible to clone dinosaurs. Write a letter to a friend that explains your investigation and how you came to your conclusion. Your letter should be between two and three pages in length, typed, and single-spaced.
2. Select an animal that can be and has been cloned successfully. Find out how scientists cloned the animal. Then, create a miniature recipe booklet that can be understood by a layperson for cloning this animal. Your booklet must contain at least two pictures and be at least five pages in length.
3. Investigate the pros and cons of genetic engineering. Then, produce two commercials that tell what you found in your research. One commercial will promote the pros of genetic engineering. The other commercial will promote the cons of genetic engineering. Each commercial must be between 45 seconds to 1 minute in length.
4. Find out what diseases scientists and doctors claim can be eliminated through genetic engineering of humans. Create a series of cartoon strips that shows your findings and possible outcomes, both good and bad.
5. Don't like any of these choices? Design a project and have your teacher approve it.