

HUMAN SCIENCE Lesson Plan

Day 1: What is the difference between RNA and DNA?



Outcomes for Today

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
 5. A Students know the general structures and functions of DNA, RNA, and protein.

PREPARE

1. Background Background knowledge to engage the content

What is DNA?

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. Most DNA is located in the cell nucleus (where it is called nuclear DNA), but a small amount of DNA can also be found in the mitochondria (where it is called mitochondrial DNA or mtDNA).

The information in DNA is stored as a code made up of four chemical bases: adenine (A), guanine (G), cytosine (C), and thymine (T). Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people. The order, or sequence, of these bases determines the information available for building and maintaining an organism, similar to the way in which letters of the alphabet appear in a certain order to form words and sentences.

DNA bases pair up with each other, A with T and C with G, to form units called base pairs. Each base is also attached to a sugar molecule and a phosphate molecule. Together, a base, sugar, and phosphate are called a nucleotide. Nucleotides are arranged in two long strands that form a spiral called a double helix. The structure of the double helix is somewhat like a ladder, with the base pairs forming the ladder's rungs and the sugar and phosphate molecules forming the vertical sidepieces of the ladder.

An important property of DNA is that it can replicate, or make copies of itself. Each strand of DNA in the double helix can serve as a pattern for duplicating the sequence of bases. This is critical when cells divide because each new cell needs to have an exact copy of the DNA present in the old cell.

<http://ghr.nlm.nih.gov/handbook/basics/dna>

2. Wordwall

vocabulary words to teach and add to the Word Wall.

Deoxyribonucleic Acid (DNA): A long molecule shaped like a twisted ladder(double helix). The plans for running and reproducing cells are chemically stored in the DNA. DNA is found mostly in the nucleus but small amounts of DNA are found in mitochondria and chloroplasts.

Amino Acid: The subunits that are chemically bonded together in proteins. The order of amino acids in a protein is what gives it the ability to do its job.

Messenger RNA (m-RNA): Messenger RNA carries instructions for making proteins from the nucleus to a ribosome.

Proteins: Molecules made up of long chains of amino acids (polypeptides). Proteins build living material, fight disease, and help transport things out of the cell. Most proteins are enzymes.

Ribosomes: The organelles where proteins are assembled.

Anticodon: The three letter word of a transfer RNA that corresponds to the amino acid it carries. The anticodon matches up with the codon of the messenger-RNA.

READ

3. View

Article:

Go to: <http://ezinearticles.com>

Search: DNA

Locate: What is DNA

Read: As a class

Article:

Go to: <http://expertpages.com/news/dna.htm>

Search: DNA

Locate: What is DNA, Part 1

Read: As a class

Video:

Go to: www.discoveryeducation.com (Subscription Based Website)

Search: DNA, RNA and Proteins

Locate: Biology: The Science of Life: DNA: The Master Molecule of Life
(approximate run time 15:20)

Character Education at the Markkula Center for Applied Ethics
www.scu.edu/character

Video:

Go to: www.discoveryeducation.com (**Subscription Based Website**)

Search: DNA, RNA and Proteins

Locate: Proteins, Amino Acids, and Messenger RNA: A Segment of:
Human Genome (approximate run time 04:20)

RESPOND

4. Visual Process.

Video Quiz:

Directions: Define each of the following.

- True or False? The four subunits of DNA are used as the "letters" of the genetic code alphabet.
- True or False? Genetic code words represent different proteins.
- True or False? Translation takes place on ribosomes.
- True or False? There is usually one gene on each chromosome.
- True or False? DNA is transcribed into messenger RNA in the nucleus.

EXPLORE

5. Activity Explore more deeply with a visual or oral language activity.

Sketch:

Draw the molecule DNA

6. Discussion Ask discussion questions that engage at many levels

Key Questions

- Describe the relationship between the linear order of code words in a gene and the order of amino acids in a protein.
- Explain the role of messenger RNA.
- Compare and contrast Replication, Transcription and Translation .

EXTEND

7. Write, Draw or Speak.

In your science journal describe the importance of proteins in living cells.

8. Close Close by extending today's lesson to what you can do in your life and the world.

Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
- *Habit I can build = Increasing healthy habits and choices*

<i>Change I can make</i>	
Habit I can build	

HUMAN SCIENCE Lesson Plan

Day 2: What is the difference between RNA and DNA?



Outcomes for Today

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
5. A Students know the general structures and functions of DNA, RNA, and protein.

PREPARE

1. Background Background knowledge to engage the content

What is the function and difference of DNA, RNA and Proteins?

DNA is a template to make RNA. DNA is a deoxyribose sugar and has thymine as one of its bases. RNA is a ribose sugar and has uracil as one of its bases.

Ribonucleic acid or RNA is a nucleic acid polymer consisting of nucleotide monomers that plays several important roles in the processes that translate genetic information from deoxyribonucleic acid (DNA) into protein products; RNA acts as a messenger between DNA and the protein synthesis complexes known as ribosomes, forms vital portions of ribosomes, and acts as an essential carrier molecule for amino acids to be used in protein synthesis. RNA is very similar to DNA, but differs in a few important structural details: RNA is single stranded, while DNA is double stranded.

<http://www.sciencedaily.com/articles/r/rna.htm>

2. Wordwall vocabulary words to teach and add to the Word Wall.

Please review the words from day one:

Deoxyribonucleic Acid (DNA): A long molecule shaped like a twisted ladder(double helix). The plans for running and reproducing cells are chemically stored in the DNA. DNA is found mostly in the nucleus but small amounts of DNA are found in mitochondria and chloroplasts.

Amino Acid: The subunits that are chemically bonded together in proteins. The order of amino acids in a protein is what gives it the ability to do its job.

Messenger RNA (m-RNA):	Messenger RNA carries instructions for making proteins from the nucleus to a ribosome.
Proteins:	Molecules made up of long chains of amino acids (polypeptides). Proteins build living material, fight disease, and help transport things out of the cell. Most proteins are enzymes.
Ribosomes:	The organelles where proteins are assembled.
Anticodon:	The three letter word of a transfer RNA that corresponds to the amino acid it carries. The anticodon matches up with the codon of the messenger-RNA.

READ

3. View

Article:

Go to: http://EzineArticles.com/?expert=Kellianne_McMillan
 Search: Crick's Central Dogma of Molecular Biology - DNA to RNA to Protein
 Locate: Crick's Central Dogma of Molecular Biology - DNA to RNA to Protein
 Read: As a class

Video:

Go to: www.discoveryeducation.com (Subscription Based Website)
 Search: DNA, RNA and Proteins
 Locate: Biologix: Transcription of DNA to Messenger RNA (approximate run time 29:07)

RESPOND

4. Visual Process.

Video notes:

You will take notes on the video shown today. Use the worksheet at the end of the lesson to help guide the students.

EXPLORE

5. Activity

Venn Diagram:

Compare and contrast the characteristics of DNA and RNA. Create a Venn diagram to show their similarities and differences.

6. Discussion Ask discussion questions that engage at many levels

Key Questions

- How did researchers make know the difference between DNA and RNA?
- Describe RNA and its role?
- What is the structure of proteins? Name two examples of proteins.

EXTEND

7. Write, Draw or Speak.

- Summarize the video, article, or passage in the space below. Use your own words.

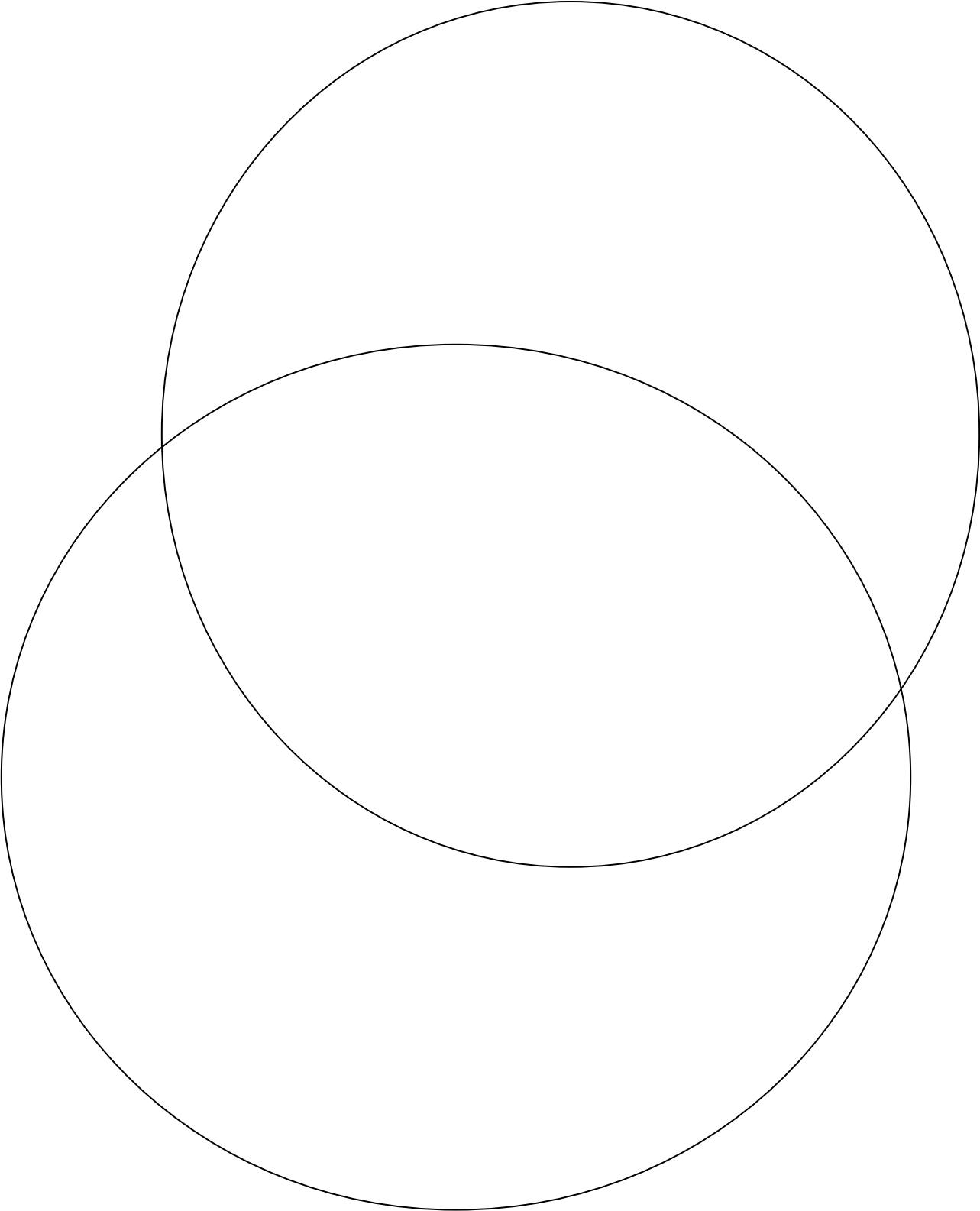
8. Close Close by extending today's lesson to what you can do in your life and the world.

Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
- *Habit I can build = Increasing healthy habits and choices*

<i>Change I can make</i>	
<i>Habit I can build</i>	

6g6 Venn Diagram Chart



Human Science Video Notes



Name:

Part I:

Note taking tips: (Cornell Notes)

- Write important details from the video, segment, article, or passage in the second column;
- After you write your notes, return to the first column and add phrases, words and questions related to the details. A sketch or picture may also be helpful.

Title:

Date:

Column 1: Phrases, words, questions or a sketch related to the details in column 2.	Column 2: Important Details

HUMAN SCIENCE Lesson Plan

Day 1: What is DNA replication



Outcomes for Today

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
5. B Students know how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.

PREPARE

1. Background Background knowledge to engage the content

What is DNA replication and when does it occur?

Enzymes initiate DNA replication by unzipping, or unwinding, the double helix to separate the two parental strands.

DNA replication occurs before cell reproduction so that each new cell contains an exact copy of DNA. DNA is usually initiated by separation of DNA strands in a small region to make a “replication bubble” in which DNA synthesis is primed. The DNA strand progressively unwind and are replicated as the replication bubble expands, and the two forks of replication move in opposite direction along the chromosome.

2. Wordwall vocabulary words to teach and add to the Word Wall.

Deoxyribonucleic Acid (DNA): A long molecule shaped like a twisted ladder (double helix). The plans for running and reproducing cells are chemically stored in the DNA. DNA is found mostly in the nucleus but small amounts of DNA are found in mitochondria and chloroplasts.

Messenger RNA (m-RNA): Messenger RNA carries instructions for making proteins from the nucleus to a ribosome.

Gene: The section of DNA on a chromosome that directs the making of a specific protein

READ

3. View

Article:

Go to: <http://www.buzzle.com/articles/dna-replication-process.html>

Search: DNA Replication Process

Locate: DNA Replication Process

Read: As a class

Article:

Go to: <http://www.buzzle.com/articles/dna-replication-process.html>

Search: DNA Replication

Locate: DNA Replication

Read: As a class

Video:

Go to: www.discoveryeducation.com (Subscription Based Website)

Search: DNA and RNA

Locate: Biologix: DNA Replication (approximate run time 29:07)

Video:

Go to: www.discoveryeducation.com (Subscription Based Website)

Search: Replication of DNA

Locate: Replication of DNA: A Segment of: Biology: The Science of Life: DNA: The Master Molecule of Life (approximate run time 1:15)

RESPOND

4. Visual Process.

Video Note Taking:

- You will use the attached note taking worksheet to take notes on information gathered while watching the video. You will complete the following:
- Write important details from the video in the second column
- After you write your notes, return to the first column and add phrases, words and questions related to the details. A sketch or picture may also be helpful.

EXPLORE

5. Activity

Explore more deeply with a visual or oral language activity.

Sketch:

- Draw the DNA double helix and the DNA replication fork and label

Cube: Who, what, when, where, why DNA replication occurs: Complete cubing exercise

1. Cut out the cube along all dotted lines on the form; this will sometimes mean cutting between squares. One of these might be an information square and one might be a flap.
2. Fold the cube form on all lines to make it easier to assemble. Fold the form back – all the folds should be behind, instead of above, the printed side.
3. Use a glue stick or paste to apply the adhesive to every shaded square. If you can't make out the shading, use the glue stick on every flap. None of the information squares should have glue or paste on them.
4. Fold the cube carefully following the directions.

6. Discussion Ask discussion questions that engage at many levels

Key Questions

- Explain what DNA is in your own words.
- What is DNA replication?
- How, when, and why does DNA replication occur?
- Why is DNA important?
- What events take place during DNA replication?

EXTEND

7. Write, Draw or Speak.

- Summarize the video, article, or passage in the space below. Use your own words.

8. Close Close by extending today's lesson to what you can do in your life and the world.

Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
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<i>Change I can make</i>	
Habit I can build	

HUMAN SCIENCE Video Notes



Name:

Part I:

Note taking tips: (Cornell Notes)

- Write important details from the video, segment, article, or passage in the second column;
- After you write your notes, return to the first column and add phrases, words and questions related to the details. A sketch or picture may also be helpful.

Title:

Date:

Column 1: Phrases, words, questions or a sketch related to the details in column 2.	Column 2: Important Details

4c12 Cubing Who, What, When, Where, Why

		Name		
		Who		
	What	When	Where	
		Why		

HUMAN SCIENCE Lesson Plan

Day 1: Is Genetic Engineering the evolution or the next step of life?



Outcomes for Today

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
5. C Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.

PREPARE

1. Background Background knowledge to engage the content

What is Genetic engineering?

Genetic engineering is a laboratory technique used by scientists to change the DNA of living organisms. In genetic engineering, one gene or most commonly, a set of a few genes is taken one DNA of one organism and inserted into the DNA of another organism.

DNA is the blueprint for the individuality of an organism. The organism relies upon the information stored in its DNA for the management of every biochemical process. The life, growth and unique features of the organism depend on its DNA. The segments of DNA which have been associated with specific features or functions of an organism are called genes.

Molecular biologists have discovered many enzymes which change the structure of DNA in living organisms. Some of these enzymes can cut and join strands of DNA. Using such enzymes, scientists learned to cut specific genes from DNA and to build customized DNA using these genes. They also learned about vectors, strands of DNA such as viruses, which can infect a cell and insert themselves into its DNA.

<http://www.safe-food.org/-issue/ge.html>

2. Wordwall vocabulary words to teach and add to the Word Wall.

Genetic Engineering:	biological and chemical methods to change a cell's DNA sequence to produce desirable's traits or eliminate undesirable traits.
Gene:	A segment of DNA on a chromosome hat directs the making of a specific protein, thus controlling traits that are passed to offspring
Vectors:	A bacteriophage, plasmid, or other agent that transfers genetic material from one cell to another.

READ

3. View

Article:

Go to: <http://www.globalchange.com/geneticengin.htm>
Search: Genetic Engineering
Locate: Genetic Engineering: What is Genetic Engineering?
Read: As a class

Article:

Go to: <http://online.sfsu.edu/~rone/GEessays/WhatisGE.html>
Search: What is Genetic Engineering?
Locate: What is Genetic Engineering?
Read: As a class

Video:

Go to: www.discoveryeducation.com (**Subscription Based Website**)
Search: Genetic Engineering
Locate: Genetic Engineering and Agriculture: A Segment of: [History's Harvest: Where Food Comes From](#) (approximate run time 21:18)

Video:

Go to: www.discoveryeducation.com (**Subscription Based Website**)
Search: Genetic Engineering
Locate: Part One: Understanding: The Power of Genes: A Segment of: [Understanding: The Power of Genes](#) (approximate run time 22:08)

RESPOND

4. Visual Process.

Advantages and Disadvantages:

Using the chart below come up with list 5 disadvantages and 5 advantages to genetic engineering?

Genetic Engineering

Advantages	Disadvantages
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

EXPLORE

5. Activity Explore more deeply with a visual or oral language activity.

- As a class, create a list of at least of as many items that you think have been genetically engineered.

6. Discussion Ask discussion questions that engage at many levels

Key Questions

- In your opinion, what is wrong with genetic engineering?
- What are some useful uses of genetic engineering?
- Do you think genetic engineering is necessary?
- Who is Sam Shepard?
- How has technology played a key role in genetic engineering?

EXTEND

7. Write, Draw or Speak.

Using the Genetic table you created in today's activity, write 1-2 paragraphs explaining whether or not you agree with genetic engineering. Support your answer with facts from the video in today's lesson.

8. Close Close by extending today's lesson to what you can do in your life and the world.

Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
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<i>Change I can make</i>	
Habit I can build	

HUMAN SCIENCE Lesson Plan

Day 1: How does a vaccine work?



Outcomes for Today

5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
5. E Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products

PREPARE

1. Background Background knowledge to engage the content

How can DNA be altered their genetic makeup to form a new protein production?

Bacterial transformation is the process by which bacterial cells take up naked DNA molecules. If the foreign DNA has an origin of replication recognized by the host cell DNA polymerases, the bacteria will replicate the foreign DNA along with their own DNA. When transformation is coupled with antibiotic selection techniques, bacteria can be induced to uptake certain DNA molecules, and those bacteria can be selected for that incorporation. Bacteria which are able to uptake DNA are called "competent" and are made so by treatment with calcium chloride in the early log phase of growth. The bacterial cell membrane is permeable to chloride ions, but is non-permeable to calcium ions. As the chloride ions enter the cell, water molecules accompany the charged particle. This influx of water causes the cells to swell and is necessary for the uptake of DNA. The exact mechanism of this uptake is unknown. It is known, however, that the calcium chloride treatment be followed by heat.

The process for the uptake of naked plasmid and bacteriophage DNA is the same; calcium chloride treatment of bacterial cells produces competent cells which will uptake DNA after a heat shock step. However, there is a slight, but important difference in the procedures for transformation of plasmid DNA and bacteriophage M13 DNA. In the plasmid transformation, after the heat shock step intact plasmid DNA molecules replicate in bacterial host cells. To help the bacterial cells recover from the heat shock, the cells are briefly incubated with non-selective growth media. As the cells recover, plasmid genes are expressed, including those that enable the production of daughter plasmids which will segregate with dividing bacterial cells. However, due to the low number of bacterial cells which contain the plasmid and the potential for the plasmid not to propagate itself in all daughter cells, it is necessary to select for bacterial cells which contain the plasmid. This is commonly performed with antibiotic selection.

http://www.genome.ou.edu/protocol_book/protocol_adxF.html

2. Wordwall

vocabulary words to teach and add to the Word Wall.

Plasmids: Small rings of DNA that exist independently of the main bacterial chromosome. They can be replicated and passed on to offspring

Vaccine: A substance that contains antigens and is used to stimulate the production of antibodies

DNA transformation: Transformation is the genetic alteration of a cell resulting from the uptake and expression of foreign genetic material (DNA). Separate terms are used for genetic alterations resulting from introduction of DNA by plasmid-encoded conjugation or by viruses (transduction).

READ

3. View

Article:

Go to: www.dnalc.org
Search: DNA Transformation
Locate: DNA Transformation
Read: Animation of DNA transformation, review as a class

Video:

Go to: www.discoveryeducation.com (**Subscription Based Website**)
Search: DNA Transformation
Locate: Biologix: Development of Molecular Genetics (approximate run time 29:00)

Video:

Go to: www.discoveryeducation.com (**Subscription Based Website**)
Search: DNA Transformation and Vaccines
Locate: Manipulation of DNA: Using Isolated Genes in the Process of Bacterial Transformation: A Segment of: [Biologix: Manipulating DNA](#) Biologix (approximate run time 07:43)

RESPOND

4. Visual Process.

Note taking tips: (Cornell Notes)

- Write important details from the video, segment, article, or passage in the second column;
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Title:

Date:

Column 1: Phrases, words, questions or a sketch related to the details in column 2.	Column 2: Important Details

EXPLORE

5. Activity Explore more deeply with a visual or oral language activity.

Journal:

- Summarize the video in the space below. Use your own words.

6. Discussion Ask discussion questions that engage at many levels

Key Questions

- Explain the importance of DNA transformation?
- Do you agree with the concept of being able to manipulate DNA with foreign genes to create a new strand of DNA? Explain your answer.

EXTEND

7. Close Close by extending today's lesson to what you can do in your life and the world.

Students should complete the chart below based on their learning from the day. They should fill in the chart with one change and one habit per day.

- *Change I can make = decreasing bad habits and bad choices;*
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<i>Change I can make</i>	
Habit I can build	

6g6 Venn Diagram Chart

