



## ***DNA! Who am I?***

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This curriculum unit is recommended for:  
7<sup>th</sup> Grade Integrated Science

**Keywords:** DNA, gene, chromosome, mode of inheritance, meiosis, recessive, dominant, trait, identity

**Teaching Standards:** See [Appendix 1](#) for teaching standards addressed in this unit.

**Synopsis:** Students will be provided with a Model of DNA, reading books, and other resources to introduce them to the concept of identifying themselves both through the physical and the biological traits. The goal is for students to be able to understand the genetic material that makes us different from one another and also to understand dominant traits that exist in themselves and their peers. Once the students understand DNA on its molecular level, students will begin to make connections to how genetic identity becomes the physical identity they see in the mirror. The next connection that students will make is how despite their genetic disposition, external factors influence how they see themselves and how they see each other as individuals.

*I plan to teach this unit during the coming year to 2017-2018 students in the 7<sup>th</sup> Grade Integrated Science Course.*

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## DNA! Who am I?

### Introduction

Cochrane Collegiate Academy is a middle school that serves students in grade 6-8. Cochrane Collegiate Academy shares its building with our magnet high school known as I-Meck.

**Cochrane Collegiate Academy is a Title I School based on the federal Elementary and Secondary Education Act (ESEA).** Cochrane's student body is approximately 986. The ethnic breakdown of the school is as follows: approximately 57% African American, 40% Hispanic, and 3% other. The school EOG scores for the past several years have shown that students scored below grade level on the Science EOG. I teach 7<sup>th</sup> grade science to approximately 100 students daily for 75 minutes. My student body also consists of many ELL (English Language Learners). I create differentiated activities within the school's objective to meet the diverse educational needs of my students.

The science curriculum is based on the North Carolina Essential Standards and paced per the CMS yearly pacing guides. Following a science as inquiry pedagogy: traditional laboratory experiences provide opportunities to demonstrate how science is constant, historic, probabilistic, and replicable. Although there are no fixed steps that all scientists follow, scientific investigations usually involve collections of relevant evidence, the use of logical reasoning, the application of imagination to devise hypotheses, and explanations to make sense of collected evidence. Student engagement in scientific investigation provides background for understanding the nature of scientific inquiry and the skills necessary for science inquiry. The process skills support development of reasoning and problem-solving ability and are the core of scientific methodologies.

Cochrane is a one-to-one technology school. Students have access to a chromebook daily. Therefore, many online resources are used to help students learn the content; such as, video clips, discovery education, youtube and other miscellaneous resources. The blended learning strategy helps student experience a more hands-on approach especially when lacking the adequate lab resources.

For each unit, students are assessed to better develop appropriate lessons and activities. Differentiated lessons are created to foster learning in the English Language Learner student.

### Rationale

Everyday when looking into the mirror, for the most part, many have asked "why do I look the way I do?" In this unit the exploration and use of DNA analysis and other identification analysis techniques will be used, in an effort to answer the aforementioned question. There is no doubt that we all come from different backgrounds and ancestry lines. How does DNA help determine family lines and ancestry? Middle schoolers are fascinated about learning more about themselves. They ask questions regularly trying to find out why they look the way they do.

Dominant and recessive traits come from our DNA. Students will learn by doing. They will learn that there are just as many similarities as there are differences between them. Questioning everything is the key to science and this is what I want my students to experience. This is my third year teaching this standard, and understanding genetics and genetic material is an area students enjoy. Students discover differences and similarities in our genetic makeup. Students will make connections between genetics and identity. The research and work in the seminar From Self to Students: Canvassing Art to Explore Identity, allows for cross-disciplinary opportunities in art, and writing.

## Objectives

The essential standard addressed in this unit and the fellowship ideas discussed during seminar have provided the foundation for the curriculum topics in the standard 7.L.2, substandard 7.L.2.2.

**7.L.2** - Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation and survival among offspring.

**7.L.2.2** - Infer patterns of heredity using information from Punnett Squares and Pedigree Analysis.

### ***What does this standard mean a child will know, understand and be able to do?***

Students will know that a pedigree is a diagram of family relationships that uses symbols to represent people and lines to represent genetic relationships. These diagrams make it easier to visualize relationships within families. Pedigrees are often used to determine the mode of inheritance (dominant, recessive, etc.) of genetic diseases. A Punnett Square is a chart wherein all possible gene combinations are shown in a cross of parents.

## Strategies

The following process skills and concepts will be addressed within this curriculum unit:

- Identify and create qualitative and quantitative observations within a science experiment or investigation.
- Design and perform an experiment or investigation demonstrating the scientific process. Collect, record, and share data within an experiment or investigation.
- Evaluate experimental data, draw conclusions based on the data, and communicate the conclusion within the science classroom. Evaluate complex text for reading elements, context clues, and applicable research data.
- Create a model to represent genetic patterns of identity.

The following Cross-Curricular Essential and Common Core Standards will be addressed within this curriculum unit:

- Common Core Standard CCSS.ELA-Literacy.RST.6-8.9
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

## **Scientific Content: Overview for Teachers**

### **Vocabulary: (see Appendix 2)**

### **Teaching Strategies**

1. **Warm-ups:** prepare students for what they are about to do and learn. The warm-up is designed and used to very specific criteria. As the students enter class and before new instruction begins, the students are asked to respond to questions, problems or prompts that will engage the students in general type of mental activity that will be part of the instruction.

2. **Frayer/ Model/Vocabulary Cards:** vocabulary cards provide a simple vehicle for supporting vocabulary development on a 3 x 5 card that is based on the Frayer Model. Vocabulary cards are designed so the student can put the target word in the arched area. This placement facilitates the kids quizzing themselves or their classmates. The four boxes have prompts that are all designed to facilitate students learning the concept. It is important to note that the prompts can be easily modified to fit the targeted word, and that no prompt is asking for a definition since definitions can be artificial and confusing. Differentiation will address the needs of the ELL learner.

3. **Interactive Notes:** students take notes in Cornell form, but have an area where they can have an interaction with the notes. The interaction could be in the form of a drawing, writing the notes in their own words, or any other interaction the student deems appropriate. In this strategy, notes are prompted in any one of several ways, but with each, I stop after each important point for note taking and interactions with the notes.

4. **Reading Assignments:** reading assignments provide the basis for understanding. Reading assignments will be at appropriate Lexile levels for students' learning abilities. Students will also read web-based articles, magazines, and excerpts from books.

5. **Video and movie clips:** having a visual connection to the material always helps students better understand the content.

6. **Labs:** students will complete various steps in lab work as they work through this unit. Labs reports and illustrations will be completed as part of the lab instruction. Students will create models.

### **Day-by Day Lessons:**

## **Day 1: Identity Lesson: Mapping Your Identity**

Lesson Question: How can students create identity maps to introduce themselves to their peers?

Lesson Overview: In this "ice breaker" lesson, students create their own "identity maps" to identify their own multiple roles, qualities and attributes. Then, students share their identity maps as a means of introducing themselves to their peers.

Length of Lesson: (75-90 Minutes)

### Instructional Objectives:

Students will:

- create identity maps incorporating words and elements from an identity handout
- share their identity maps in a small or large group setting

### Materials Needed:

- student notebooks
- white board
- computers with Internet access
- large drawing paper (one sheet per student)
- markers (one per student)

### Instructional Strategies for Lesson 1:

Warm-up: Looking up the word identity and pictures related to identity.

- Start this lesson by looking up the word identity on the computer. Students will write down and define as many words related to identity as they can. They will also look up pictures they believe define identity.
- Show students Prince Ea's video: "I am NOT Black, I am NOT White":  
<https://www.youtube.com/watch?v=q0qD2K2RWkc&list=RDq0qD2K2RWkc&t=258>  
And let them have a discussion about identity and the labels individuals are given.

Direct Instruction: Introducing the concept of an identity map:

- Explain to students that today they will be mapping their own identities, in a similar fashion to the people and word maps they have seen on the Visual Thesaurus. Although they may not be well known or famous for their different roles, they will use this mapping opportunity to introduce themselves to their peers through their identity maps.
- Distribute a sheet of large drawing paper and a marker to each student.
- Instruct each student to use a marker to write his or her name in the center of the drawing paper with large bold letters.

Brainstorming roles and nouns:

- Encourage students to consider all the roles they may identify with in the different facets of their lives. They can think of their familial roles (Big brother? Big sister? Baby of the family?); their roles in school (Writer? Reader? Scientist? Historian? Artist? Class clown?); their roles outside of school--on the playground, on the Internet, or among friends (Hoopster? Gamer? Confidant?); or any other roles that may come to mind
- Direct students to draw a different line or ray on their identity maps for each role they wish to include. At the end of each line, they should write the word that identifies that particular role. Students should include at least three or four of these lines.

#### Incorporating adjectives:

- Explain to students that they may wish to include adjectives on their maps to describe themselves.
- Adjectives could be written at the end of lines that originate at their names and branch out (if they are adjectives that generally apply to their identities), or they could be rays surrounding a particular role (e.g., the adjective "responsible" might be used to describe "big sister," or "prolific" may be used to describe "writer").
- Encourage students to use the Thesaurus if they are gravitating to vague, trite or commonplace adjectives. For example, if a student has decided to include "kind" on his map, use the thesaurus word map for "kind" and inquire if he could be more descriptive in his use of adjectives (sympathetic? tolerant? charitable?).
- Students should include at least five or six adjectives in their identity maps.

#### Wrap-up:

##### Sharing Identity Maps:

- Once students have completed their identity maps, have them use the maps as a way to introduce themselves to their classmates.
- In order to save class time, you could have students share the maps in small groups or in a "gallery walk" format (where students post the identity maps on the classroom's walls and students circulate around the room reading the maps and leaving feedback on sticky notes).
- After sharing their identity maps, students could discuss their observations. What did they learn about their peers through this mapping exercise? What roles do many students share? What adjectives were the most descriptive or unique?

##### Extending the Lesson:

- One way to extend this lesson would be to have students incorporate other Thesaurus "relationships" in their identity maps. For example, a student could reveal what he or she "is not" by including an antonym relationship, or a student could draw a "is a member of" line to designate a club or team affiliation.

Assessment/Closure/Exit Ticket:

- Assess students' identity maps based on the variety of the roles and adjectives they included. Did they consult the Thesaurus to avoid use of vague or trite adjectives? Did they include multiple roles to show different facets of their lives? Did they share their identity maps with their peers in an engaging manner?

## **Day 2 - Day 5: Heredity and Traits<sup>1</sup>**

Lesson Question: How do my traits differ from those of my classmates?

Lesson Overview: Students take an inventory of their own easily observable genetic traits. Working in small groups, they observe how their trait inventories differ from those of others. Students record their observations in a data table and make a bar graph to show the most and least common traits in the group.

Length of Lesson: (75-90 Minutes)

Instructional Objectives:

Students will be able to:

- Explain how traits are observable characteristics that are passed down from parent to child.
- Explain how an individual will have many traits they share in common with others.
- Explain how an individual's overall combination of traits makes them unique.
- Explain how Some traits are more common in a population than others.

Materials Needed:

- student notebooks
- computers with Internet access
- An Inventory of My Traits Handout (Instructions and Spanish Versions)( Appendix 3)
- Family Traits Trivia PDF ( Instructions and Spanish Versions) (Appendix 3)

Instructional Strategies for Lesson 2:

Warm-up: Ask students to stand if they possess the following traits:

- a. I have dimples
- b. I can roll my tongue
- c. I am right handed
- d. I have allergies

- e. I have naturally curly hair
- f. I have attached earlobes

Point out the relative numbers of students standing and sitting for the trait. Continue this process with 2-3 more traits.

Direct Instruction:

- Explain that traits are observable characteristics we inherit from our parents. Some traits are common in a population (our class) while others are not. And, every person has a different overall combination of traits that makes them unique.
- Divide students into groups of four or more. Have each student in the group complete An Inventory of My Traits: Survey (Appendix 3) to determine their unique combination of the traits described
- After students complete the survey, have them tally their group information on the data table (Appendix 3) and draw a bar graph (Appendix 3).
- Optional: You may collect the traits data from the whole class by creating a large wall chart (see example on the left). Have a representative from each group fill in their data. Once all the data has been collected, have the students make a bar graph from the class data or make one large graph together

Wrap-up:

- Extending the Lesson: Assign the Family Traits Trivia Game as homework for students to complete activities at home. We have been learning about inherited “traits” at school. These are physical characteristics that can be passed down from parent to child. This family activity can help your child learn to identify inherited traits.
- Assessment/Closure/Exit Ticket: Assess students by collecting their completed graphs from the Inventory of My Traits Handout.

**Day 3:**

Lesson Question: How can I record and track the different combination of traits observed from my parents and siblings?

Lesson Overview: In this hands-on activity students track and record the passage of colored pom-pom “traits” through three generations of gingerbread people. Students observe that traits are passed from parents to offspring, and that siblings each receive a different combination of traits from their parents.

Length of Lesson: (75-90 Minutes)

Instructional Objectives:

Students will be able to:

- Traits are observable characteristics that are passed down from parent to child.



- An individual will have many traits they share in common with others, and more so with siblings and parents.
- An individual's overall combination of traits makes them unique.
- An equal number of traits are passed on from each parent.

Materials Needed:

- student notebooks
- computers with Internet access
- Six plastic cups, 24 pompoms (6 brown, 6 green, 6 yellow, 6 red), crayons (brown, green, yellow and red), tape and marker for labeling the cups
- Traits-Generation Handout (Instructions and Spanish Versions) (Appendix 3)

Instructional Strategies for Lesson 3:

Warm-up: Ask students to complete a brain dump and jot down for two minutes all the words they think about when they think about the following words: identity and physical appearance.

Direct Instruction:

- Begin instruction by pointing out that every person in the class has a unique combination of "traits" or observable characteristics. Discuss some examples of traits (eye color, handedness, height, etc.).
- Invite students to consider why children often resemble their siblings and parents. Explain that these resemblances occur because traits are passed down from parent to child. Have students think, pair, write, share.
- Divide students into groups of 3 or 4. Give each group a set of materials. Instruct students to carry out the activity following the instructions on student handout (Appendix 3)..
- Suggest that students close their eyes and mix the pom-poms with their hands each time before drawing them out. This will yield a more random and varied result.

Discussion Points:

- If the siblings in a group's family end up with the same combination of traits, remind students that human characteristics are determined by far more than six traits. It is possible to have six or more traits in common with another person, yet still maintain a unique appearance.
- Because siblings inherit traits from the same parents they often look alike. However, a child randomly inherits half of his traits from each parent. As a result, siblings each inherit a different combination of traits.

Wrap-up:

- Extending the Lesson: One way to extend this lesson would be to have students complete a homework assignment where students can go home and complete this activity with a neighbor or a friend and then prepare for a discussion in the next day's class of the students results. Students can then have a discussion of their findings.
- Assessment/Closure/Exit Ticket: Assess students by collecting the handout and providing feedback.

#### **Day 4:**

Lesson Question: How can I create DNA strands to observe how variations in DNA lead to inheritance of different traits.

Lesson Overview: Students create and decode a "DNA recipe" for man's best friend to observe how variations in DNA lead to the inheritance of different traits. Strips of paper (representing DNA) are randomly selected and used to assemble a DNA molecule. Students read the DNA recipe to create a drawing of their pet, and compare it with others in the class to note similarities and differences.

Length of Lesson: (75-90 Minutes)

#### Instructional Objectives:

Students will be able to:

- Explain that every organism inherits a unique combination of traits.
- Explain that DNA is a set of instructions that specifies the traits of an organism.
- Explain the variations in the DNA lead to the inheritance of different traits.

#### Materials Needed:

- student notebooks
- computers with Internet access
- one envelope containing "Dog DNA"
- crayons or colored pencils
- drawing paper
- tape

#### Instructional Strategies for Lesson 4:

Warm-up: Have students Think/Pair/Write/Share their thoughts on the following question: Are any two dogs alike? Point out that every dog shares some traits in common with others, but each has an overall combination of traits that is unique.

#### Direct Instruction:

- Display different types of instructions (e.g. a recipe book, a blueprint, a DNA molecule) and ask students for what they might use these instructions. Explain that just as a recipe is used to cook a meal or a blueprint is used to build a home, DNA contains instructions that specify an organism's traits.
- Read the beginning paragraph of A Recipe for Traits (Appendix 3) as a class. You may want to show them a completed DNA "recipe" and point out the different segments (representing genes) as well as the 4 symbols (representing the 4 chemical bases A, C, G and T) that make up the DNA alphabet in this activity.
- Review the instructions on page S-1. You may want to demonstrate how to use the Dog Traits Key (Appendix 3) to read the DNA recipe and identify the first trait.

- Remind students to leave the DNA strips they choose out of the envelope and tape them together in order. The resulting long strand will be their DNA recipe.
- Have students work individually or in pairs to complete the activity. When students have finished, have them post their dog drawings on the wall along with the DNA recipe for their dog.

Wrap-up:

- Extending the Lesson:
  - As a class, make a “map” of your dog genome. Compare the different DNA recipes hanging up in the classroom. Point out that the gene for body shape is always at the top of the DNA molecule (or chromosome), the gene for head shape is always second, and so on. Draw a representation of a chromosome having 8 segments. Have students come up with a name for each gene. Label the segments with the gene names, and specify the trait they encode. Point out that although each dog looks differently (has a different combination of traits), it is still possible to make a general map of the dog genome.
  - Show students a completed map of the human genome. The map can be found at the following link:  
<https://public.ornl.gov/site/gallery/highres/GenomePoster2009.pdf>  
and discuss how researchers have mapped the 22,000 plus genes to particular locations on the 23 pairs of human chromosomes.
  - Assign as homework a memory match game in which participants must discern the difference between a trait that is inherited or one that is learned/environmental. (See Appendix 3)
- Assessment/Closure/Exit Ticket: As a class have students leave comments on sticky notes on what they liked the most about today’s lesson. Have students post the notes on the board on the way out.

**Day 5:**

Lesson Question: How can I extract my DNA in order to explain my genetic traits?

Lesson Overview: Students will observe their own DNA by extracting it from their own cheeks. Students will learn the simple method of DNA extraction and will be able to explain the rationale of each step.

Length of Lesson: (75-90 Minutes)

Instructional Objectives:

Students will be able to:

- observe their own DNA and genetic makeup
- explain the rationale of each step of DNA extraction
- explain why DNA extraction helps students explain dominant and positive traits

Materials Needed:

- student notebooks
- computers with Internet access
- test tubes with 5 ml of detergent solution
- capped tubes with 10ml of rubbing alcohol
- bottle with prepared salt solution
- dixie cups
- plastic coffee stirrer
- flat wood sticks
- small Eppendorf tube - pipettes

Instructional Strategies for Lesson 5:

Warm-up: Students should know about the basic function of DNA and its location. Complete a vocabulary activity with students to make sure they know the basic function of DNA and its location. (Use a Frayer Model for Vocabulary)

Direct Instruction:

Getting ready:

1. Prepare the 0.9 percent salt solution (2 teaspoons of table salt dissolved in 1 quart/liter of water)
2. Pour 10ml of salt solution in dixie cups; one for each student
3. Prepare 25 percent detergent solution (1 volume of detergent mixed with 3 volumes of water)
4. Fill large labeled test tubes with 1 teaspoon (5ml) of detergent solution; one for each student
5. Fill labeled test tube with 2 teaspoons (10 ml) of rubbing alcohol and seal; one for each student. Store in the fridge. The alcohol needs to be cold for the extraction to be successful.
6. Prepare a tray with materials for each pair/table or set-up another procedure to hand-out material to students.

Introduce students to the lab:

Prepare slides of cheek cells, stained with methylene blue. Have student look at slide under microscope or show on screen. Discuss what they see (methylene blue stains the nucleus) and the size of nucleus, chromosomes, DNA.

Activity:

Students can either perform the extraction individually/with their partner following their worksheet or teacher can model the extractions while the whole class follows along step by step. Directions for the extraction:

1. Have students swirl the 10 ml of salt solution in their mouths for 30 seconds. This will remove dead cells lining the mouth.

2. Have students spit their solution back into their dixie cup and then pour it into the large test tube containing the detergent solution.
3. Students should then cap the test tube and GENTLY rock it on its side for 2-3 minutes. IMPORTANT: Don't shake the test tube or mix it too vigorously. DNA will break into smaller fragments and will be harder to see later on.
4. After 3 minutes, have students uncapped their tube, slightly tilt it and carefully pour the chilled alcohol down the side of the test tube. The alcohol and the detergent should form two distinct layers with the alcohol sitting on top.
5. Have students let the tube stand for one minute. Then, have them use the coffee stirrer to slowly move some of the ethanol into the soap layer. DNA will start to precipitate out of the soap solution. Have students twirl the stirrer to spool the DNA strands around it. If the DNA fragments are too short to wind up, students can use the pipette to suck up the fragments.
6. Students can transfer the DNA into a small tube (Eppendorff tubes work well), filled with rubbing alcohol. The DNA should be stable in that form for a long time.
7. Students will transfer a small amount of their DNA to the class test tube set to be tested for genetic marker similarities.

Formative Assessment during lesson:

Ask questions that make students think about the rationale of steps of the extraction process: Why are we using the detergent? What does it do to the cell? Ask questions to check if students understand the size of DNA molecules. Make sure they understand that they would NOT be able to see one individual strand of DNA. The white strands that are becoming visible contain many DNA strands clumped together. How will your DNA compare to another student's DNA. Do you think your traits will be the same or different than others in the class?

Wrap-up:

- Extending the Lesson: Have students observe human cheek cells and chromosomes under the microscope to reinforce the idea of the scale of DNA molecules.
- Assessment/Closure/Exit Ticket: Have students create pictures of what they saw in their test tubes. Have students label the DNA strands using genetic markers.

### **Day 6 - Day 9: Identity and Genetics**

Lesson Question: How does my DNA and traits help me define who I am?

Lesson Overview: A typical cell of any organism contains genetic instructions that specify its traits. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Length of Lesson: (75-90 Minutes)

Instructional Objectives:

Students will be able to:

- infer that their DNA has specific instructions that specify the traits they see in each other.
- create models (both virtual and on paper) of their DNA and genetic traits.

#### Materials Needed:

- student notebooks
- computers with Internet access
- poster paper
- markers, crayons, or colored pencils

#### Instructional Strategies for Lesson 6:

##### Warm-up:

##### Direct Instruction:

Students will spend 10-12 minutes navigating through a website and taking notes in their student notebooks. Let students make their own decisions as to what they want to write down in their notebook. When monitoring the students encourage to navigate to the What is Inheritance tab. This will help when the instruction moves to the identity portion of the lesson. (<http://learn.genetics.utah.edu/content/basics/>)

Students will complete posters that depict their DNA and genetic material. Students should be allowed to use all materials from the 5 previous classes. Students should be encouraged to walk around the room and make observations of the similarities and differences amongst each other. Students should be encouraged to discuss these differences.

This class should be a fun and interactive class and students should be asked to show all dominant and recessive traits in themselves and their families.

##### Wrap-up:

- Extending the Lesson: There is a great number of fruits that can be used for DNA extractions. Have students perform DNA extractions on strawberries at home using their lab notes. "Strawberry DNA extraction" labs can be found on the web and at this site (<http://www.seplessons.org/node/217>) It's a good idea to compare the amount that DNA that different extractions yield. Nice discussion starter for the next lesson to show the differences in the number of chromosome sets in various organisms.
- Assessment/Closure/Exit Ticket: Completed student posters.

#### **Day 7 - Day 8:**

Lesson Question: How does my DNA and traits help me define who I am?

Lesson Overview: Students will use data from their genetic labs and information that they will begin to gather from identity lessons to start investigating how DNA leads to identity.

Length of Lesson: (75-90 Minutes)

Instructional Objectives:

Students will be able to:

- learn about the qualities that make their classmates unique as well as the qualities they have in common.
- create a culminating activity that will showcase lab findings and art

Materials Needed:

- student notebooks
- computers with Internet access
- poster paper
- markers, crayons, and colored pencils
- Student work from previous lessons

Instructional Strategies for Lesson 7 and 8:

Warm-up: Students will watch videos

<https://www.youtube.com/watch?v=Q93iL-HSiNc>

<https://www.youtube.com/watch?v=HMq7QkR4fGI> (watch to 1:28)

Students will then write “I am” statements.

Direct Instruction:

- Students will create a gallery of answers from their warm ups. Students will then perform a gallery walk and view student “I am” statements. Students will return to their seats and have a class discussion on the two videos watched.
- Students will review Day 1 assignment.
- Identity Four Corners activity: students are given time to respond independently to statements related to the topic of identity. Then, students move to corners that correspond with their answers (strongly agree, agree, disagree, strongly disagree) and discuss.
- Define the word “identity” as a class.
- Quick written response to the word “identity”.
- Explain the culminating activity and final art project.
- Provide students with a rubric for art project.
- Students will begin working on the final art project.

Wrap-up:

- Assessment/Closure/Exit Ticket: Have students complete a brain dump. One side of paper students will write about DNA and the other side of the paper students will write about identity.

### **Day 9-Day 10:**

Lesson Question: How can I show mastery of the standards objectives.

Lesson Overview: Students will review for summative written assessment. Students will complete projects.

Length of Lesson: (75-90 Minutes)

### Instructional Objectives:

Students will be able to:

- show mastery of standard 7.L.2.2 through a written assessment and a culminating assignment.

### Materials Needed:

- student notebooks
- computers with Internet access
- student notebooks
- computers with Internet access
- poster paper
- markers, crayons, and colored pencils
- Student work from previous lessons

### Instructional Strategies for Lesson 9-10:

Warm-up: Show students Prince Ea's video: "I am NOT Black, I am NOT White": This is the same video the students saw on Day 1 when they began the genetics unit.

<https://www.youtube.com/watch?v=q0qD2K2RWkc&list=RDq0qD2K2RWkc&t=258>

Allow students a discussion about identity and the labels individuals are given and listen to differences in answers from the answers on Day 1. The expectation is that students will now include comments about genetic traits, DNA and identity trends.

### Direct Instruction:

- Students will participate in a Socratic Circle and discuss the video, the classrooms genetic lab results, and the students culminating projects. (Appendix 4- How to conduct a Socratic Seminar).

### Wrap-up:

- Extending the Lesson: Encourage students to continue to discuss and question genetics and identity.
- Assessment/Closure/Exit Ticket: Students will complete a summative assessment. This can be in the form of a written assessment and a culminating project.



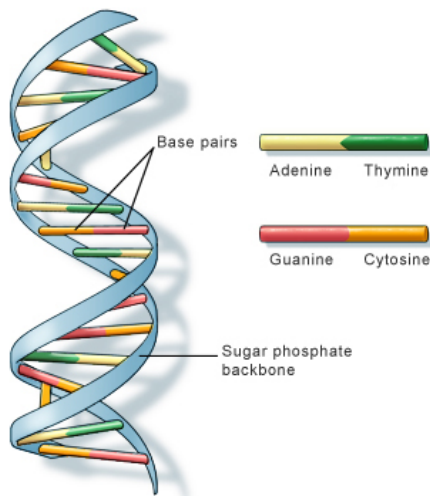
## Content Research/Theory

The word identity has many definitions. Dictionary.com defines it as “the fact of being who or what a person or thing is”. Webster-Merriam defines identity as “sameness of essential or generic character in different instances:sameness in all that constitutes the objective reality of a thing. Despite the academic definitions, the true meaning of identity continues to baffle many. It is my expectation that the students will also struggle with this theme also identity. The In this unit, the connection is going to be made through the study of DNA and genetics. Students will learn about their individual dominant and recessive genes. Identity on the other hand is an ever changing phenomenon influenced by external factors as well as internal factors. As a student struggles with identity, the goal is for the student to self discover physical and genetic similarities within themselves and his peers.

Genetics, is defined as the study of heredity and the variation of inherited characteristics. ([www.dictionary.com](http://www.dictionary.com)). In the 7th grade genetics is an exciting subject as students grapple with questions about where they obtained their external looks. In addition, it is a time when students’ bodies are physically changing. When studying genetics, the emphasis will be on dominant and recessive traits. A dominant trait is defined as a trait that will appear in the offspring if one of the parents contributes it. ([www.dictionary.com](http://www.dictionary.com)). A recessive trait is defined as a trait that must be contributed by both parents in order to appear in the offspring. ([www.dictionary.com](http://www.dictionary.com)). Therefore, a person may have a recessive trait but may never exhibit a physical trait related to that recessive trait.

After completing the genetics lesson, the academic talk will move away genetic makeup to the external factors and physical appearance that contribute to the student identity. Through academic conversation, students will begin the journey from pedigree analysis to self-identity. James Gee in Betsy Ryme’s book states that “new student identities, then, are constructed by *definition* through talk. (From Self to Students: Canvassing Art to Explore Identity 2017 CTI Seminar notes, 2017) The goal of this lesson is to introduce the students to both the internal and external factors that determine identity.

The U.S. National Library of Medicine defines DNA, or deoxyribonucleic acid as “the hereditary material in humans and almost all other organisms” and “nearly every cell in a person’s body has the same DNA.” (Retrieved from: <https://ghr.nlm.nih.gov/primer/basics/dna>). 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. (U.S. National Library of Medicine, Retrieved from: <https://ghr.nlm.nih.gov/primer/basics/dna>). The illustration below shows the genetic pattern in DNA.



U.S. National Library of Medicine

Despite humans all having very similar patterns in DNA, the genetic traits humans exhibit provide a different physical appearance. Traits are what humans exhibit in their physical appearances. Traits are inherited from parents and grandparents. Traits may be dominant or recessive. Only dominant traits are shown in a person’s physical appearance. But where does identity fit in with genetic traits, and when do traits and identity cross paths. Does how we look determine our identity? When does identity become fully developed? “It would be a mistake to assume that the development of the self-concept begins and ends in adolescence. Very young children are also going through this psychological growth, as are adults. whether they admit to it or not.” (From Self to Students: Canvassing Art to Explore Identity 2017 CTI Seminar notes, 2017). This lesson connects science with identity through the exploration of DNA and identifying genetic traits and identity self-awareness activities.

Identity development occurs throughout a person’s life. Identity is affected by not only biological influences but also by external factors. Some of these external factors are family, friends, religion, social status and other factors. “Identity is multidimensional and may include physical and sexual identity, occupational goals, religious beliefs, and ethnic background. Adolescents explore these dimensions, and usually make commitments to aspects of their identity as they move into early adulthood. Periodically, adults may reevaluate and alter certain aspects of their identity as life circumstances change.” (Retrieved from <http://social.jrank.org/pages/322/Identity-Development.html>) Identity Development - Aspects of Identity Adolescence usually occurs between the ages of 10-19. Middle schoolers are usually struggling with the concept of identity. In examining identity in this unit, the focus will be on external factors that shape the student’s identity.

As one may recall from one’s own adolescence, we often think of our adolescent years a time when there was physical changes occurring. Changes in height, maturation, appearance of certain characteristics and development of certain behaviors occurs during adolescence. In addition to the physical changes, the “mind is also going through a far-reaching development. In

modern societies, at least, adolescence is a period of *self-definition*. The young person begins to develop a sense of *identity*, a concept of *himself*. He is starting seriously to ask and to attempt to answer the crucial question: *Who am I?* (From Self to Students: Canvassing Art to Explore Identity 2017 CTI Seminar notes, 2017).

Who am I? That is a great question and the purpose of this unit lesson. Middle schoolers will be able to explore identity and genetics. Specifically, how genetics may influence physical appearance through genetic traits, but physical appearance does not always influence self-identity. The activities, discussions and lectures will focus on the intertwinings of these concepts and the anticipated outcome is a better understanding of both DNA and identity in the middle schooler. “This process of discovering *who am I* is extremely complex because “it involves not only the individual, but also his family, his friends, his teachers, his heroes, and indeed everyone with whom he comes in contact.” (From Self to Students: Canvassing Art to Explore Identity 2017 CTI Seminar notes, 2017) Despite the process being complex, it will also prove to be an exciting time for the student to learn the scientific foundation of identity.

### **Pre Assessment and Post Assessment**

There will two types of pre-assessments in this unit. One pre-assessment will focus on genetics and the other one will focus on self-identity. The genetics and self-identity pre-assessment will be part of a diagnostic assessment. Diagnostic assessments are used to assist the teacher in determining the strengths, weaknesses, knowledge, and skills of individual students prior to instruction. An educator primarily uses diagnostic assessments to identify student difficulties and to guide lesson planning. Diagnostic assessment benefits both the teacher and the students by allowing teachers to plan meaningful and efficient lessons. In addition, it allows for student differentiation. The results of diagnostic assessments aid the teacher in planning for individual, small group, advanced, and remedial learning.

The post-assessment will focus on what the students have mastered and how they have mastered the content. The students will complete two types of summative assessments: a culminating art project and a written multiple choice, short response exam. Summative assessment are used to *evaluate student learning* at the end of a unit to determine whether the student has met the objective or standard that the educator has been teaching. Summative assessments are an evaluation of what the student has learned during this learning unit.

(Appendix 5)

- a. Genetics Assessment with pictures.docx
- b. Art Project Rubric (teacher creates for required mastery skills needed)

### **Art Product**

In science it is all about the hands-on experience. In this unit the students will be completing an experiment, some hands-on activities and eventually exemplifying mastery. The students will express the identity experience in a culminating art project. The art project will be expressed in a poster. Students will use the genetic trait markers from lab and identity lesson ideas to create

their own poster exemplifying their own idea of identity. The art project is expected to fulfill the expectations of a rubric.

## Notes

<sup>1</sup>Lesson handouts are on one web-link on Appendix 3 -Lessons 2-5 have been adapted for 7-8 grade from [teach.genetics.utah.edu](http://teach.genetics.utah.edu)

## Annotated Bibliography

1. Dictionary.com. *Dictionary.com Unabridged*. Random House, Inc. <http://www.dictionary.com/browse/genetics>(accessed: October 26, 2017) (This website offers definitions for unknown vocabulary words).
2. Genetics Science Learning Center, Retrieved from: <http://teach.genetics.utah.edu> (This website offers many lessons on genetics and several handout to use with students. The handouts are available in Spanish).
3. Katie Woodard, *My First Book About DNA*. (This book is written for children and should be used to read to or as a resource for students in class).
4. Kilgaraff and Roji, Mr. DNA, *The Legend of DNA* (This book is written for children and should be used to read to or as a resource for students in class).
5. Magnenat-Thalmann, Nadia, Osman Ratib, and Hon Fai Choi. 2014. *3D Multiscale Physiological Human*. (This book showcases the human body, DNA and genetic makeup with detailed illustrations).
6. Robin, Stéphane, François Rodolphe, and Sophie Schbath. 2005. *DNA, words and models*. Cambridge, UK: Cambridge University Press. (This book provides a more in depth explanation of DNA. The resource also has many models of DNA that can be shown to students as examples for the art project.)
7. Storyjumper.com, Retrieved from: <http://www.storyjumper.com/book/index/14253712/Mr-DNA#page/2> (This website has many easy to read books for students to use for research when completing their final art project).
8. The U.S. National Library of Medicine. Retrieved from: <https://ghr.nlm.nih.gov/primer/basics/dna> (This website offers a simple definition for DNA as well as illustrations to use for student research).
9. Thinkmap, Visual Thesaurus, Retrieved from: <https://www.visualthesaurus.com/cm/lessons/mapping-your-identity-a-back-to-school-ice-breaker/> (This website allows students to make identity maps).

## Student Resources

1. <http://blokify.com/> (Students can create virtual models of DNA and chromosome strands)
2. Katie Woodard, *My First Book About DNA*. (This book is written for children and should be used to read to or as a resource for students in class).
3. Kilgaraff and Roji, Mr. DNA, *The Legend of DNA* (This book is written for children and should be used to read to or as a resource for students in class).
4. Youtube.com (Youtube has many videos on identity and on DNA for students to view)

## Teacher Resources

### Appendix Links

Appendix 1: (7th Grade Science Standards) <https://docs.google.com/document/d/1PkdxTZu-KxI2Wkslxn4yVyoEgeBqvo9Iyb4b9vKnEgQ/edit>

Appendix 2: (Vocabulary List for the Unit)

[https://docs.google.com/document/d/1mr1gPDkTG\\_rvwOVrJ8-1M1KvV2Ir4XVvL6ug2QxjrwQ/edit](https://docs.google.com/document/d/1mr1gPDkTG_rvwOVrJ8-1M1KvV2Ir4XVvL6ug2QxjrwQ/edit)

Appendix 3: (Link to all handouts used in lessons)

[https://docs.google.com/document/d/1pHG3xaQ9\\_LzTP1WUTkKn7RU0Uqa2jjeUGpCc6\\_Ztfug/edit](https://docs.google.com/document/d/1pHG3xaQ9_LzTP1WUTkKn7RU0Uqa2jjeUGpCc6_Ztfug/edit)

Appendix 4: (Link to how to conduct a socratic seminar)

[http://minds-in-bloom.com/5-steps-to-successful-socratic-seminar\\_29/](http://minds-in-bloom.com/5-steps-to-successful-socratic-seminar_29/)

Appendix 5: (Link to the 7.L.2.2. assessment)

<https://docs.google.com/document/d/1ZuarudTPDCSUc4cXvYR3PezhAI2KwWQf5CWGO4s3unA/edit>

## Useful websites for teachers

Daly Ralston Resource Center: DNA extraction kits, K136, K179, K318 (teacher can order DNA kits from this website).

[http://sep-rc.ucsf.edu/researcher?details=2185#\\_](http://sep-rc.ucsf.edu/researcher?details=2185#_) (teachers can order DNA extraction kits from this website)

<http://www.seplessons.org/node/217> (Website has many useful genetic lessons).

<http://teach.genetics.utah.edu> (Website has many lessons on genetics for many grade levels).