

# **Weiler Health Education Center**

Human Heredity  
Growth and Development  
Grades 6-9

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## Program Objectives

### Program Description:

Through an in-depth discussion of scientific concepts, students learn how genetic concepts explain human characteristics and health conditions delivered at fertilization.

### Standards:

**PA Standards** 3.3.7ac, 3.3.10ac; 10.1.9e

**NJ Standards** 2.1.8b, 3.4.6a

### Objectives:

Upon completion of the program, students will:

1. identify DNA as the chemical of heredity
2. recognize the twisted double helix model as DNA
3. list three genetically inherited traits
4. list three factors that can mutate genes

### Terms:

**Bases-** small molecules that help make up the DNA molecule (adenine, guanine, thymine, cytosine)

**Chromosomes-** Long sections of DNA that are coiled up inside the nucleus of a cell. 23 chromosomes are donated from both mom and dad to give us the 46 chromosomes needed to make a human being

**Deoxyribonucleic Acid (DNA)-** The chemical found in cells that determines inherited traits

**Dominant Trait-** a physical characteristic that has a higher likelihood of showing up in a human being

**Double Helix-** The shape of the DNA molecule; a “twisted ladder”

**Genes-** a section of DNA on a chromosome that codes for a specific trait

**Genetics-** The study of the passing of characteristics from parent to child

**Mutations-** Unexpected changes in the DNA

**Recessive Trait-** a physical characteristic that has a smaller chance of being seen in a human being

**Traits-** Physical characteristics that show up as a result of genetic sequence



## Reading Comprehension Worksheet

### Objective:

To utilize reading comprehension skills to identify inherited characteristics and recognize influences that may cause genetic mutations.

### Directions:

1. Read the short story below.
2. Use the information in the story to answer the discussion questions.
3. Discuss answers as a class.

### Discussion Questions:

1. Identify 4 genetic physical traits that are explained in the story about Maggie Marlow.
2. What factor(s) in the story may put Maggie at risk for developing a genetic mutation?
3. Should Maggie be concerned about any inherited diseases? Why? (this may require a little additional research)
4. List 2 of Maggie's characteristics that are **not** inherited traits.

### Maggie Marlow

It was a bright, crisp, fall day and Maggie Marlow was on her way home from school. She was lumbering down the street as she tried to manage the awkward case she held in her left hand. Over her left shoulder, she slung her backpack. It was heavy under the weight of her Advanced Algebra and Advanced Biology book. Maggie had long brown hair that was pulled up in a pony tail and she was much shorter than she would have liked, a very proud four foot eleven and a half inches.

Up ahead, Maggie saw her best friend Herbert, who was standing over a pile of books and papers, looking very distraught.

"What's up?" yelled Maggie as she rushed over to Herbert.

"Oh, nothing...My backpack just ripped and now my stuff is all over the ground. Where are you going?" asked Herbert.

"I'm going home. Today was the last rehearsal before the show Friday night and I wanted to take my guitar home and restring it. Why? Do you need help?"

Herbert started to get a little annoyed.

"No, I guess I'll just stand here all afternoon and wait for some nice person to come along and help me. I thought it would be you, but I guess I was wrong." He huffed.



“Okay, okay...” Maggie agreed. “I’ll help you... Jeeze! Do you see I’m carrying this guitar and a backpack of my own? Plus, I have to get home to see my mom before she goes to the hospital for more x-rays tonight. I usually go with her to hold her hand, but tonight I need to watch my little sister. So, it is the last chance I will have to see her before she checks into the hospital tomorrow morning. ”

“Is she still sick?” asked Herbert. “I thought she was doing better.”

“Diabetes doesn’t go away, Herbert. You have it forever,” said Maggie knowingly.

“I thought there was something wrong with her foot,” said Herbert quite confused, “what does that have to do with diabetes?”

“The sore on her foot was a result of the diabetes,” explained Maggie. She is going in to get her foot fixed, but when the surgery is done, she will still have diabetes.”

“Oh, sorry...” huffed Herbert. “What do I know? Hey, are you going to help me or not?”

“Okay, okay...” she said as she gathered up all of Herbert’s papers. Maggie steadied herself under the weight of all she had to carry and she and Herbert were on their way.

She really did like Herbert. When they were younger, he used to count the freckles on her face (he always stopped once he reached one hundred). She loved that.



## Cracking the Code

Directions: Use the morse code in the chart to decode the question in the message below. The letters are separated by slash marks

A *-	N -*
B -***	O ---
C -*_*	P *_**
D -**	Q --*_
E *	R *_*
F **_*	S ***
G --*	T -
H ****	U **_
I **	V ***_
J *---	W *_--
K -*_*	X -**_
L *_**	Y -*--
M --	Z --**

\*--/ \*\*\*\*/ \*/ \*\_\*/ \*/ \*\_ / \*\_\*/ \*/ --\*/ \*/

\_\*/ \*/ \*\*\*/ \*\_\*\*/ ---/ -\*\_\*/ \*\_ / -/ \*/ -\*\*

2. Write the answer to the question below in morse code.

3. Morse code was originally created for use during times of war. Why would we need to use code to transmit messages?



## Who am I?

Objective: To create a strand of “genetic code” and use it to identify students in the class to reinforce the relationship between DNA and physical characteristics.

Assignment:

1. Attached is a list of physical traits, each matched with a specific “genetic code”
2. Locate your physical traits on the chart and write your code that you have next to the category below:
  - a. Eye color
  - b. Eyebrows
  - c. Earlobes
  - d. Hair Color
  - e. Hair Texture
  - f. Freckles
  - g. Dimples
  - h. Tongue
  - i. Hairline
3. Used the attached sheet to create your own unique strand of DNA (Do not put your name on it) Put one letter in each box.
4. The code should follow the same order as listed above. (starting with eye color and so on...)
5. When finished, hand in your strand of DNA
6. Once all strands of DNA are handed in they will be given back to the students randomly.
7. Finally, the students will use these strands of DNA to locate the student to whom it belongs.



## TRAIT TABLE

Trait	Code		Trait	Code
Blue Eyes	AGA		No Dimples	CGG
Green Eyes	ATA		Tongue Roll	TAC
Brown Eyes	ACA		No Tongue Roll	TGC
Hazel Eyes	AAA		Widows Peak	CCC
Bushy Eyebrows	GAG		Straight Hairline	TGT
Thin Eyebrows	GTG		Dimples	GGT
Uni-brow	GCG		Wavy Hair	CCA
Attached Earlobes	CTC		Straight Hair	CTT
Detached Earlobes	CAT		Curly Hair	CGA
Brown Hair	CAA		No Freckles	TTC
Red Hair	CTA		Freckles	TCA
Blonde Hair	CTG			
Black Hair	TTA			



# Reading Comprehension Worksheet- Answer Sheet

## Objective:

To utilize reading comprehension skills to identify inherited characteristics and recognize influences that may cause genetic mutations.

## Directions:

1. Read the short story below.
2. Use the information in the story to answer the discussion questions.
3. Discuss answers as a class.

## Discussion Questions:

1. Identify 4 genetic physical traits that are explained in the story about Maggie Marlow.  
**Left Handed, Brown Hair, Short, Freckles**
2. What factor(s) in the story may put Maggie at risk for developing a genetic mutation?  
**None, Maggie's mom had the x-rays**
3. Should Maggie be concerned about any inherited diseases? Why? (this may require a little additional research)  
**No, Diabetes is not an inherited disorder**
4. List 2 of Maggie's characteristics that are **not** inherited traits.  
**Smart, Music Talent**

## Maggie Marlow

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"I'm going home. Today was the last rehearsal before the show Friday night and I wanted to take my **guitar** home and restring it. Why? Do you need help?"

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"No, I guess I'll just stand here all afternoon and wait for some nice person to come along and help me. I thought it would be you, but I guess I was wrong." He huffed.



“Okay, okay...” Maggie agreed. “I’ll help you... Jeeze! Do you see I’m carrying this guitar and a backpack of my own? Plus, I have to get home to see my mom before she goes to the hospital for more x-rays tonight. I usually go with her to hold her hand, but tonight I need to watch my little sister. So, it is the last chance I will have to see her before she checks into the hospital tomorrow morning.”

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G --*	T -
H *****	U **_
I **	V ***_
J *---	W *--
K -*_*	X -**_
L *_**	Y -*--
M --	Z --**



\* \_ / \* \* \* \* / \* / \* \_ \* / \* / \* \_ / \* \_ \* / \* / \_ \_ \* / \* /

Where are genes found?

\_ \* / \* / \* \* \* / \* \_ \* \* / \_ \_ \_ / \_ \* \_ \* / \* \_ / \_ / \* / \_ \* \*

2. Write the answer to the question below.

Genes are units that make up chromosomes, they found inside the nucleus of the cell

3. Morse code was originally created for use during times of war. Why would we need to use code to transmit messages?

Various Answers

Note to teacher- the following letter is intended for your students to take home as a follow-up for the days program. Please copy and distribute as you see fit in order to enable caregivers of students to reinforce the lesson of this program effectively.



# Weller Health Education Center

Dear Caregiver,

Your child has participated in a program called “Human Heredity” presented by the Weller Health Education Center. This program teaches students about genetics and why it plays an important part in our lives. They discussed the future genetics may play in our lives by explaining ideas such as genetic diseases, cloning, and forensic science. Students further learned how genetic concepts explain human characteristics and health conditions. The students discussed activities people engage in that can lead to gene mutations. The students learned how to distinguish what is a dominant trait versus recessive trait and how we end up with our physical attributes. The Weller Health Education Center emphasizes being knowledgeable about our genetics and the diseases that people may be predisposed to.

Researchers have identified more than 4,000 diseases that are caused by genetic differences. However, having a genetic mutation that may cause disease doesn't always mean that a person will actually get that disease. On average, people probably carry from 5 to 10 variant or disease-carrying genes in their cells. Problems arise when the disease gene is dominant or when the same recessive disease gene is present on both chromosomes in a pair. The science behind genetics can be confusing for many but is often fascinating to kids because it explains why they have certain traits and appearances. For more information on genetics that may help, check out [www.kidshealth.org](http://www.kidshealth.org).

Below you will find some sample activities to guide you in taking steps to improve your family's health. These activities can help to continue the message started today in our program. For additional resources you are welcome to utilize the parent, teacher and student resource links found on our website at [www.wellercenter.org](http://www.wellercenter.org).

Sample Activities:

- 1) Talk to students about the differences they notice about family members and which traits may be attributed to which parent.
- 2) Certain health risks and diseases are genetically linked. If this is the case for diseases of concern in your home, try to discuss these and focus on the preventable risk factors that can be personally managed.

Yours in good health,  
Weller Health Education Center