



Their Rightful Place in the Sun

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Ranson IB Middle School

This curriculum unit is recommended for:
World Languages Level I Courses

Keywords: genetics, genes, inheritance, epigenetics, DNA methylation, bilingualism, lead, lead poisoning

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

Synopsis: This unit will focus on informing students about epigenetics and creating agency around students' informing others. Using PSAs, letter-writing, and poster-making, students will educate others and advocate for change. Students will learn about epigenetics and some specific effects they can have on the brain. Then, students will use their knowledge to inform others and serve as agents for change.

I plan to use this curriculum unit in my Spanish I and Spanish for Native Speakers I classes. This unit is designed to be taught in five class days. This unit can be taught at any point in the year, however beginning of the year is recommended in order to increase students' desire to be multilingual.

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Introduction

Rationale

Whiteness is centralized in the United States of America. If an individual can pass for white, that person receives certain levels of privilege that those who cannot pass could not even begin to dream of having. Cis-maleness is centralized in the United States. If an individual can pass for cis-male, that person receives privileges that those who cannot pass for cis-male cannot receive. Affluence is centralized in the United States. If an individual is affluent or tightly connected to affluence, that person has access to privileges that one who is not cannot fathom receiving. These three power structures maintain the status quo in the US. They are what guard the separation that allows the powerful to remain in and gain power and the powerless to find themselves at nearly impossible odds to obtain power.

These power structures also happen to be the same structures that cause children who have beautiful and honorable heritage from places inside and outside of the US borders to question their value and whether or not their people have contributed or can contribute to society. They also are what cause children to deny their birthright to bilingualism or multilingualism by refusing to communicate with others in their native tongue for fear of chastisement and ridicule. They are what causes a student to deny his love for *arroz y habichuelas* (rice and beans) because that is what is associated with being Mexican and he or she does not want to fall into those stereotypes. They are the structures that cause Julietta (pronounced: Hoo-lee-et-ah) to allow everyone to call her Julie (pronounced: Joo-lee) because that is easier and makes her stand out less because “Julie” does not tip off her Hispanic heritage.

These power structures and how they play out in our society, more specifically in our educational system, are what influenced me to develop this particular curriculum unit. As a middle school teacher, I experience the peak of the identity crisis among young adolescents on a daily basis. I have seen students go from loving BTS one minute to hating them the next because their best friend no longer finds the band cool enough to listen to. As a teacher in a Title I school, I interact with students who have experienced levels of trauma to the magnitude of a trained soldier returning from war zones abroad. Some have told me stories of having loved ones taken out of their lives due to major illness, horrific accidents, gun violence, and incarceration. As a Spanish teacher, I see the manifestations of racial and ethnic and social trauma when I ask Hispanic and Latinx students their names and they provide me with the “Americanized” version of it and when I greet them in Spanish and they respond to me in English out of habit of denying their linguistic abilities. Both of the last mentioned scenarios are attempts to “fit in” with a society that consistently “others” them.

In response to my observations, I have dedicated in all of my Spanish courses, and most intentionally in my Spanish for Native Speakers course to counteract this forceful pull that causes my students to feel uncomfortable being their authentic selves. I believe, and research shows,¹ that children learn most when they can engage with their education in a way that is culturally relevant to them. Because our public school system was originally designed by and for white, affluent, males, most students in urban settings are not afforded the opportunity to see themselves in the curriculum their provided year after year. In addition to this lack of visibility,

the teaching techniques and strategies that are often utilized to teach a diverse set of students are antiquated, resulting in an even further lack of connection to learning.² By the time students get to middle school, they have either conformed to the idea of centralizing whiteness and have begun erasing portions of their own identity or they have been battered so harshly by the system that their levels of apathy are high and they have practically given up on educational success. Neither scenario truly prepares students for the twenty-first-century, global professional world that they are supposed to graduate into after twelve or so years in our educational system.

That said, this curriculum unit is my attempt at giving my students the opportunity to choose a path of self-efficacy and agency. It is an attempt at showing them there is an extreme level of intentionality around a society not wishing or caring to see their multi-linguistic and multicultural capabilities as an asset and influencing them to wash those portions of their identity away. I also want students to know that a key component of learning is application and that one form of applying the knowledge they gain through this unit is engaging civically. I want my students to have a chance to reflect on their heritage in a way that shows them that the current state of their people does not rely on any form of ineptitude on the part of their ancestors nor must the current state remain as is. They need to know that the state of the oppressed and marginalized is not due to any fault on their part AND that there is something to be done about it and they, the students, can be the ones to do it.

Turning toward the academic perspective, I have always had a love for seeing how multiple realms can combine to create the world we experience daily. With that, interdisciplinary learning has been a passion of mine since beginning my career in education. This unit brings this to light in that students will be engaging in lessons about genetics, biological processes, world history and politics, and Spanish language development all at once. Participants' cognitive abilities will be developed as they hone twenty-first-century skills like critical thinking, media literacy, and defense of thoughts and beliefs. This unit will also give way to students developing higher levels of social and emotional health in that they will have a stronger sense of self and therefore be better prepared to interact across lines of difference.

Lastly, it is my hope that, above all else, this unit will begin to close a gap between my students and the generations before them in their families. I have noticed a great divide between first-generation American students and their parents. There is a linguistic disconnect, a cultural gap, and a difference in opinions as to what is "normal." I see parents and other loved ones fighting to maintain the strength and pride of their heritage among the younger generation and high levels of defiance and rebellion from that younger generation. White supremacy is something that has been intentionally handed down from generation to generation and this unit has been formed with the intention that powers which may combat this ideal can be constructed and developed so that years from now my students can look back and say that they were a part of the movement that sparked the change.

School/Student Demographics

Ranson Middle School is an International Baccalaureate (IB) World School. All classes implement the IB Middle Years Programme curriculum. Our scholars are taught with the IB Learner Profile in mind. Ranson has chosen to focus on the inquirer, risk-taker, caring, open-minded, and principled character traits. We also build scholars' twenty-first-century skills by incorporating IB approaches to learning from the following categories: communication, social, self-management, research, and thinking. This curriculum unit intends to incorporate all categories.

The ethnic and racial breakdown at my school during the 2017-2018 school year was 65% Black, 25% percent Hispanic, 5% American Indian and Asian, and 5% White or Other. We recently combined school populations with another school. The ethnic and racial breakdown of that school during the 2017-2018 school year was 81.5% Black, 11.6% Hispanic, 3.6% American Indian and Asian and 3.3% White or Other. Given the fact that zoning lines did not change for either school, I would imagine it safe to say that the racial and ethnic breakdown of my school for the current school year (2018-2019) is very similar. With such a large population of students of color, it is imperative that my students are provided curriculum that is relevant to them. An interesting dynamic about this demographic breakdown is that even though Hispanic students are the second largest population at my school, there is an inadvertent silencing that takes place for them. They either fade into the background and disguise their heritage or make distinct efforts to assimilate. This curriculum unit addresses said silencing by centering the heritage of students of color.

Unit Goals

By the end of this unit, students will be able to define epigenetics, provide one example of a positive epigenetic effect, and provide one example of a negative epigenetic effect. By the end of this unit, the instructor will be able to define Culturally Relevant Pedagogy and provide one example of how it is infused into this curriculum unit, define epigenetics and provide one example of how epigenetic effects impact the generation of students we currently teach, and identify one way in which he or she has gained agency in the fight against systemic racism and classism.

Content Research

Epigenetics is the study of how a person's environment influences his or her genetic expression. For at least a century, we have looked at Deoxyribonucleic Acid (DNA) as the ultimate determining factor for a person's disposition, physical and character traits, and predisposition and likelihood of being diagnosed with certain diseases. Interestingly enough, epigenetics has shown us that our nurturing actually influences these things in a way superior to the DNA we are born with. This is why epigenetics is titled as it is. "Epi" means above and as David S. Moore, the author of *The Developing Gene*, states, this is to illustrate not the fact that nurture overpowers our genes, but that our nurture's influence on our genes exceeds what we are made with at the root.³

This is great news for Lamarck whose ideas and theories were cast out while the world clung to Darwinism. Lamarck's idea was that adaptation happens based on the parents' environment. He believed that a parent's genes changed as they responded to their environment and those new genes were then inherited by the offspring. Theoretically, since these genes were formed as an adaptation to the current environment, the offspring of this individual would be more likely to survive to reproductive age and pass on these favorable genes to future generations. Although neither theory agrees 100% with epigenetics, there are clear connections to Lamarck's and Darwin's theories throughout the field of epigenetics.

There are a couple of key mechanisms by which the alteration of genetic expression occurs. One is known as DNA methylation and the other is known as histone acetylation. Since DNA is a very long molecule, it must wrap itself around "DNA holders" called histones in order to fit inside the nucleus of a cell. Through the process of methylation, the DNA is "turned off" and therefore cannot be expressed when the strand is used to create RNA. Since only RNA is allowed to leave the nucleus and the making of proteins happens outside the nucleus, the proteins that this portion of the DNA would code for are not produced. Histone acetylation causes portions of the DNA to unwrap from the histone. This allows the DNA to be expressed while the strand is copied into RNA. Therefore, the proteins that this portion of the DNA would code for are produced once the RNA reaches the ribosome (a special particle that decodes the RNA and makes proteins based on the code). Of the two processes, DNA methylation is the most long-standing because methylated DNA can last over the course of the life of the living thing.⁴ More information and added visuals can be found in this [Youtube video](#) made by Carlos Guerrero-Bosagna⁵.

Lead exposure has detrimental effects on neurological processes, especially when the exposure is early in life (including prenatal exposure). Recently, the damage caused by lead exposure have been linked to the methylation or lack thereof in certain portions of the DNA. Remembering that methylation causes DNA to remain "unexpressed," copying of these portions of the DNA would keep certain proteins from being made. Thus, neurological cells do not develop properly and damage occurs.⁶

It is important to note that lead exposure occurs among the most vulnerable of our populations in the US, those living in poverty and populations with high concentrations of people of color. This was recently brought to the center of the attention in the US when the news of the crisis in Flint, Michigan broke out. It was discovered that an erroneous decision to change the source of water for the town of Flint resulted in high levels of lead in the water. The water from the Flint River, the new water source, was many times more acidic than that of the Detroit water system, the original water source. Due to this acidity, the pipes corroded as the water from the river passed through them and lead leached into the water that residents of Flint used daily as a source of hydration and tool for sanitation and alimentation. Mona Hanna-Attisha, a Flint Physician and author of *What the Eyes Don't See: A Story of Crisis, Resistance, and Hope in an American City*, a book in which she studies the causes and effects of the Flint Water Crisis, has been cited stating that "poor, minority neighborhoods have been disproportionately hurt."⁷ For instructors, a strong connection could be made here with students who share similar backgrounds in that the instructor could push students to research their neighborhoods to find the number of

lead poisoning cases around them and do an analysis that compares their communities to others that are nearby.

Bilingualism has been connected to a variety of cognitive benefits for the individual. Bilingual individuals have been found to be more economic in their thought processes.⁸ Higher executive function has also been identified as characteristic of bilingual individuals. This increase in executive function is due to stronger prefrontal cortex networks.⁹ Networks in the brain are formed based on neurons and synapses, or connections, between them. Methylation is correlated with strengthening of the synapses.¹⁰ The exact mechanism by which bilingualism affects this process is unknown, but bringing these ideas together leads one to believe that bilingualism influences the epigenome in a way that affects methylation.

The reason why epigenetics is so powerful is that it debunks many myths that we have been socialized to believe for so long. One myth in particular is that of racial superiority. Racial superiority assumes that 1) Race is something that is defined by a person's genetics, 2) There is one race that is greater than them all, and 3) These ideas are acceptable because it is the fault of someone's origin and not the social flaws of humans. Modern genetics has actually fully disproven assumption number one above. We now know that more than 99% of DNA is similar across "racial" groups and that there is statistically more variation within a particular "racial" group than between different ones.¹¹ Additionally, there is more variation among peoples found on the continent of Africa than there is among all other peoples of the world combined. With Africa being the birthplace of the human race, this further disproves race as a genetic construct.¹²

Given that race is a social construct that we have for centuries "explained" through science (and other fields), it is relieving as someone on the receiving end of racism to finally have science that negates the inaccurate claims of white supremacy. Take the ideas in epigenetics to K-12 classrooms across the country and we have got ourselves fertile grounds for true innovation and creativity. One might think this last statement is a stretch, so I will draw the connection.

Carol Dweck and her team have gifted us all with a phenomenal idea. Although the idea is not very new, they developed a method of communicating it that has caught on with the masses. The idea is called the "growth mindset." To paraphrase, the "growth mindset" is a frame of thinking in which an individual believes that through some effort of his or her own, he or she has achieved or will achieve the successes he or she seeks. The individual's mind is not "fixed" or boxed in to having a predetermined set of capabilities and not being able to change his or her outcome or destiny.¹³

The reason I say this idea is not new is because we have heard this from Henry Ford, "Whether you think you can or you think you can not, you are right"¹⁴ and we have heard it from the Bible "As a man thinketh, so is he."¹⁵ I am certain there are other religious proverbs or historical figures that claim this same idea. No matter the source, the idea that your circumstances do not have to be your circumstances and you can do something about it, otherwise known as self-efficacy, is a powerful gift to any human being. This may even be the original idea behind "pulling oneself up by his or her own bootstraps" which is now an idea that is revered by those of privilege and despised by those who, generation after generation have been

denied access to “boots” or “straps.” The point being made here is that epigenetics is the “growth mindset” of science. It tells us that although there are some things about us that are out of our control because of our DNA, there are even more things we can do or not do to influence our genetic expression.

Bringing this idea into the classroom in schools like mine (filled with students belonging to ethnic and racial groups that have been and continue to be oppressed in the United States) could be the shift that sparks the end to racism (and other isms) in the US. Bringing epigenetics into a class like the one in which I intend it to be taught will go beyond the aforementioned ideas and bring students to their rightful place in the sun.¹⁶

Instructional Implementation

Teaching Strategies

Course Overviews and Connections to Content

Spanish for Native Speakers is a course intended to address the literacy needs of scholars who due to heritage have strong speaking and listening skills in the Spanish language but little-to-no reading and writing skills. It is also designed to give Hispanic/Latinx students an opportunity to develop their capacity in these areas by studying literature, geography, history, and culture associated with Hispanic heritage. It is important to note that Spanish for Native Speakers also allows students to gain access to more advanced Spanish coursework more rapidly than traditional learners of Spanish because they gain entry to Spanish IV after just two courses. This curriculum unit seeks to increase scholars’ engagement with the course as a means of ensuring they continue on to the advanced coursework, providing access to further opportunities for academic advancement, like Advanced Placement courses.

Of the six units within the Spanish for Native Speakers I curriculum, there are two units within which this curriculum unit could be placed. These units are “¿De dónde somos? ¿Cómo es nuestra geographia?” (“Where are we from? What is our geography like?”) and “Nuestra cultura y los grupos étnicos” (“Our culture and [its associated] ethnic groups”). Given its environmental and historical content, this unit could be well-placed as a bridge between these two units.

Because this unit seeks to identify the benefits of the epigenetics effects of bilingualism it can also serve well for students in a traditional Spanish I class. The purpose of Spanish I is to expose scholars to the Spanish language and its associated cultures while building a foundation for secondary language acquisition. Often times, my scholars do not seem to fully grasp the positive outcomes of having bilingual abilities. Additionally, I often encounter students that do not recognize their agency within developing their abilities. This unit could be used as an introductory unit in order to increase students’ level of belief in themselves to acquire a new language and their own agency in doing so.

Classroom Culture

The establishment of a strong classroom culture is highly necessary for the success of this curriculum unit. Given the sensitive nature of the content, students not only must feel that they can trust their teacher, they must also feel that they can trust their peers. It is recommended that this unit be utilized once the class has spent at least three to four weeks of class time together.

This way, students and teacher have plenty of opportunity to establish strong cultural norms within the classroom that would allow for rich discussion and collaboration from student-to-student and between the teacher and students. Additionally, the teacher should consider ways to incorporate students' families into the unit. This could be done through inviting the students' families in to participate in the class discussions and assist with the final presentations. Maximal benefit of family participation could be reached by allowing the families to serve as the primary resources for the work involved in the curriculum unit.

At my school, we utilize restorative circles.¹⁷ These are opportunities to build community beyond content because they allow for the teacher and the students to be on the same level and contribute in equal manners. Restorative circles can be used for a variety of reasons including the types of discussions involved in this curriculum unit. It is recommended that the teacher use lighter topics to introduce the concept of restorative circles in order to practice norms and build scholars' capacity for participating in them. In order to have a properly functioning restorative circle, a teacher must have a talking piece and established norms. It is important to note that the teacher must think ahead of time what participation in the circle looks like. The teacher must decide which topics or questions every student must answer and which of those are based on students' willingness to engage. When implemented properly, the teacher should not be left with a topic or question in which none of the students decide to engage.

Classroom Lessons and Activities

The essential question for this unit is: what parts of my biology am I in control of? The rationale here is to push students' thoughts about self-efficacy and personal agency. It also serves a dual purpose in that it will push students to question prevailing beliefs about DNA and determinism.

Lesson 1

The ideal timeframe for this lesson is one hour. Supplies necessary are devices to view videos, copies of Appendix 2 and 3, scissors, and glue.

Learning objective: Students will be able to define epigenetics. Students will be able to define epigenetics using terms like DNA, histones, methyl groups, and expression.

Performance task: Students will create diagram with fast facts about epigenetics and how it works.

The language chunks: epigenetics, methyl groups, histones, DNA, expression

Cultural context notes: For the past 100 years or so, we have believed that DNA is the universal determiner of everything in biology. We have believed that the genetic code that people are born with stays exactly the same over the course of their lives, and therefore, as soon as people are formed in the womb, every detail about them is established and there is nothing they or anyone or anything else can do to change this. Epigenetics breaks down this belief by showing us that external factors, our nurture, influence the expression of our DNA (nature).

Can-do statement: I can accurately define epigenetics using other scientific terms.

Do-Now: Choose the most accurate definition of epigenetics from the following list.

- A) An energy drink made of antioxidants, beta blockers, and protein inhibitors

- B) A style of exercise that increase your heart rate by utilizing a variety of intervals
- C) The study of changes in organisms caused by modification of the gene expression rather than the alteration of genetic code¹⁸
- D) The scientific mechanism through which bees generate honey

Focused Instruction 1: DNA Basics

Instructor states: Everything about our bodies can be traced back to a small molecule called deoxyribonucleic acid. Deoxyribonucleic acid is known as DNA for short. We will watch a 5-minute [video](#)¹⁹ that will explain to us some key facts that we will need to know for today's lesson. *Distribute Lesson 1 DNA Video Fact Sheet (Appendix 2)*

After viewing of the video, review the answers to the sheet.

- | | |
|----------------|-----------------|
| 1) recipe | 6) genetic code |
| 2) amino acids | 7) nucleus |
| 3) proteins | 8) cytoplasm |
| 4) work | 9) RNA |
| 5) DNA | 10) ribosome |

Focused Instruction 2: How do epigenetic factors affect DNA expression?

Instructor utilizes the following video as a tool for students to create a diagram about how epigenetics works. Video would be best viewed on individual devices, but could be viewed whole-class. (<https://www.youtube.com/watch?v=kp1bZEUgqVI>)²⁰

Distribute "Lesson 1 Five Things to Know about Epigenetics" (Appendix 3) and scissors and glue. Advise students that they only need to watch minutes 0:00-3:46 and 5:12-6:03. Allow students fifteen minutes to view video and complete diagram.

Check For Understanding: Instructor circulates the room and cold-checking with students about the five facts that they need to know about epigenetics.

Exit Ticket: Choose the most accurate definition of epigenetics from the following list.

- A) An energy drink made of antioxidants, beta blockers, and protein inhibitors
- B) A style of exercise that increase your heart rate by utilizing a variety of intervals
- C) The study of changes in organisms caused by modification of the gene expression rather than the alteration of genetic code
- D) The scientific mechanism through which bees generate honey

Lesson 2

The ideal timeframe for this lesson is one hour. Supplies necessary are notebook paper, chart paper or poster board, letter-writing template (Appendix 4), and fast facts about the effects of lead and bilingualism on the brain.

Lesson Objective: Students will be able to state at least one effect of lead and one effect of bilingualism on the brain.

Performance Task: Students will demonstrate knowledge gained by either designing a poster that promotes bilingualism or writing a letter to legislators about the impacts of lead on the brain.

Language chunks: bilingualism, executive function, processing, synapses, methylation, networks

Cultural context: Many students in schools across the USA are afforded the opportunity to study a language other than English. However, when you ask many adults in the US about their ability to use and understand a language based on their studies in school, they often have little to no ability. This shows that there may be a need to encourage increased use of foreign languages. Demonstrating epigenetic effects of bilingualism on the brain may help. Lead exposure is an issue of high frequency in the USA, especially in communities with large populations of people of color or with low incomes. It is important that students are aware of this fact and that they are aware of their agency in creating change.

Hook: *Instructor invites students to recall information about epigenetics from previous lesson. Instructor tells students that today's lesson will be about specific, real-life examples that could be relevant to the students.*

Do Now: List one harmful effect of lead on the brain and one positive effect of bilingualism on the brain.

Focused Instruction 1: *Instructor tells students to create a T-chart on a blank sheet of notebook paper. One side needs to be titled "Lead" and the other side "Bilingualism." Instructor states that students will complete the chart as he/she walks through the fast facts listed below.*

Lead exposure in early childhood is linked to:

- 1) Increased instances of learning disabilities
- 2) Increased risk for Alzheimer's disease
- 3) Altered sensory function

Bilingualism is linked to:

- 1) More economic thought processes
- 2) Increased levels of executive function (more efficient decision-making)
- 3) Stronger connections between neurons

Check for Understanding 1: *Instructor walks around to check to see that students have completed the T-chart. Instructor encourages students to discuss thoughts about the knowledge they have gained.*

Focused Instruction 2: *Instructor provides some tips about poster-making and letter-writing for students. Tips can include items about editing or developing an idea. Instructor should gauge scholars' needs for completing the performance task and provide tips accordingly.*

Check for Understanding 2: Students write letters or create posters based on their knowledge about epigenetics and the effects of lead or bilingualism on the brain.

Exit Ticket: List one harmful effect of lead on the brain and one positive effect of bilingualism on the brain.

Lesson 3

The ideal timeframe for this lesson is one hour. The necessary supplies are a video of a PSA that is relevant to your students, chart paper or display board, and copies of “Lesson 2 Script Template” (Appendix 5).

Learning Objective: Students will be able to identify and define key components of a script.

Performance Task: Students will produce a script for their Public Service Announcement about epigenetics.

Language Chunks: script, Public Service Announcement, scene heading, action, character name, parentheticals, dialogue, transitions, INT, EXT

Cultural Context: Historically in the USA, PSAs have been utilized to spread information that the author or sponsor has deemed significant for the greater good of all people. Usually the information is new or not commonly known.

Hook: Instructor will show a PSA about something relevant to students. (Ex: Michelle Obama Let’s Move PSA: <https://www.youtube.com/watch?v=nDv3lYmDbU8>)

Do Now: Match the following terms with their proper definitions.

1) Parenthetical 2) Dialogue 3) Scene Heading 4) Transition

- A) the portion of the script that identifies the time and place of the action
- B) the portion of the script that shares what the characters say
- C) the portion of the script that describes a shift in the action
- D) the portion of the script that give instructions or context for how the characters say things

Focused Instruction 1: *Instructor explains what PSAs are, including their purpose. Optional: Share video on how to make a PSA (<https://www.youtube.com/watch?v=nDv3lYmDbU8>)²¹ Instructure sets the purpose by reminding scholars that they will use the information they learned about epigenetics in the previous class to make their PSAs.*

Focused Instruction 2: *Instructor walks through each portion of the script and describes the formatting. Utilize the definitions found at <https://screencraft.org/2015/05/07/elements-of-screenplay-formatting/> to recreate the diagram found below²² and add definitions to it. Diagram can either be displayed via technology or recreated on chart paper.*

Scene Heading — INT. OFFICE - DAY

Action — RUFUS sits at a desk, fingers furiously tap dancing on a keyboard. He pauses for briefing and looks at the clock on the wall. The digital display reads "5:34"

A TIRE SCREETCH

Rufus looks out the office window to see JOHN storming into the office complex.

Character Name — RUFUS (V.O.)
(sarcastically)
Here comes the sexiest man in the universe.

John bursts in through the front door.

Parenthetical — JOHN
(breathing heavily)
Hell's Bells Rufus, the traffic is insane. Is it ready?

Dialogue — RUFUS
Is what ready?

JOHN
(repeating himself)
Is it ready?

RUFUS
You said you wanted uncompressed video. It's going to take an hour to transfer... at least.

Transition — FADE OUT

INT. OFFICE - THE NEXT DAY

Rufus is again typing away at his desk when John burst in.

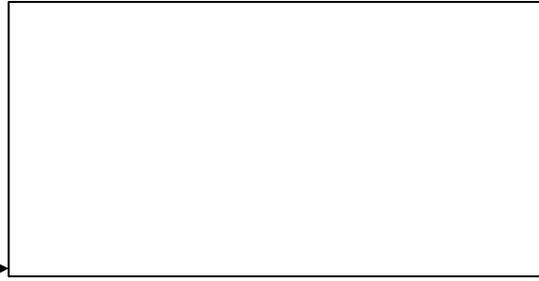
JOHN
Is it ready?

RUFUS
No... these files are huge...

Check for Understanding: Instructor presents a script example (below) and allows students to label the parts or fill in an example.

- > INT-Classroom-Day Time
- > Trenton sits at his desk, fumbling with a Chromebook that is yet again moving too slow to get him logged on.
- > TRENTON

Dialogue



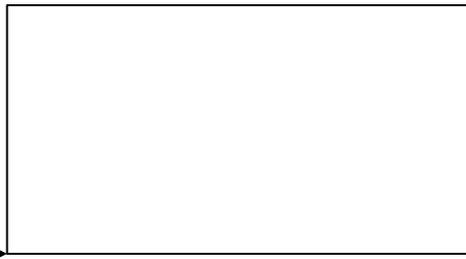
Character Name

MRS. MAHONEY PAULINO

(with a smile on her face and a hint of sarcasm)

Trenton, now if I could get new Chromebooks, don't you think I would have by now?

Transition



Instructor provides students with script template (Appendix 6) and instructs students to create PSA scripts.

Exit Ticket: Match the following terms with their proper definitions.

1) Parenthetical 2) Dialogue 3) Scene Heading 4) Transition

- A) the portion of the script that identifies the time and place of the action
- B) the portion of the script that shares what the characters say
- C) the portion of the script that describes a shift in the action
- D) the portion of the script that give instructions or context for how the characters say things

Lesson 5

The ideal timeframe for this lesson is 1-hour. Supplies necessary are students' reviewed and edited scripts and devices for recording the PSA.

Lesson Objective: Students will be able to demonstrate knowledge about epigenetics.

Performance Task: Students will deliver a 30-sec PSA sharing information about epigenetics.

Hook: *Instructor reinforces the importance of PSAs and how the work the students have done for the past two lessons has prepared them for the filming they will do today.*

There is no need for a Do Now and Exit Ticket for this lesson. The majority of the time for this lesson is to be spent allowing students to film their PSAs. If necessary, time may also be used to allow students to create props for the PSAs. If time allows, instructor should display students' completed projects at the end of class.

Appendix 1

North Carolina Biology Teaching Standards

Biology

Bio.3.2. Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.

Bio.4.1 Understand how biological molecules are essential to the survival of living organisms

Appendix 2

Lesson 1 DNA Video Fact Sheet

Directions: Use the terms below to complete the sentences. Each term can only be used once.

Ribosome	Genetic code	Recipe	Work	Cytoplasm	Amino acids
RNA	Nucleus	Proteins	DNA		

- 1) DNA acts as the blueprint or a _____ for a living thing.
- 2) _____ are referred to as the “building blocks of life.”
- 3) When combined together, amino acids form _____.
- 4) If proteins are the wrong shape, they do not _____.
- 5) _____ tells amino acids how to line up and form perfect protein shapes.
- 6) The chemical sequence of DNA is also known as its _____.
- 7) DNA lives in the center of the cell known as the _____.
- 8) Amino acids live outside the nucleus in what is called the _____.
- 9) The copies of DNA that get to leave the nucleus are called _____. *Note: These copies are made through a process called *transcription*.*
- 10) A special particle called a _____ reads the RNA and pulls in amino acids that combine and form a protein. *Note: This process is called *translation*.*

Adapted for viewing of [“What is DNA and How Does It Work?” by Stated Clearly](https://youtu.be/zwibgNGe4aY)
(<https://youtu.be/zwibgNGe4aY>)

Lesson 1 DNA Video Fact Sheet

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Ribosome	Genetic code	Recipe	Work	Cytoplasm	Amino acids
RNA	Nucleus	Proteins	DNA		

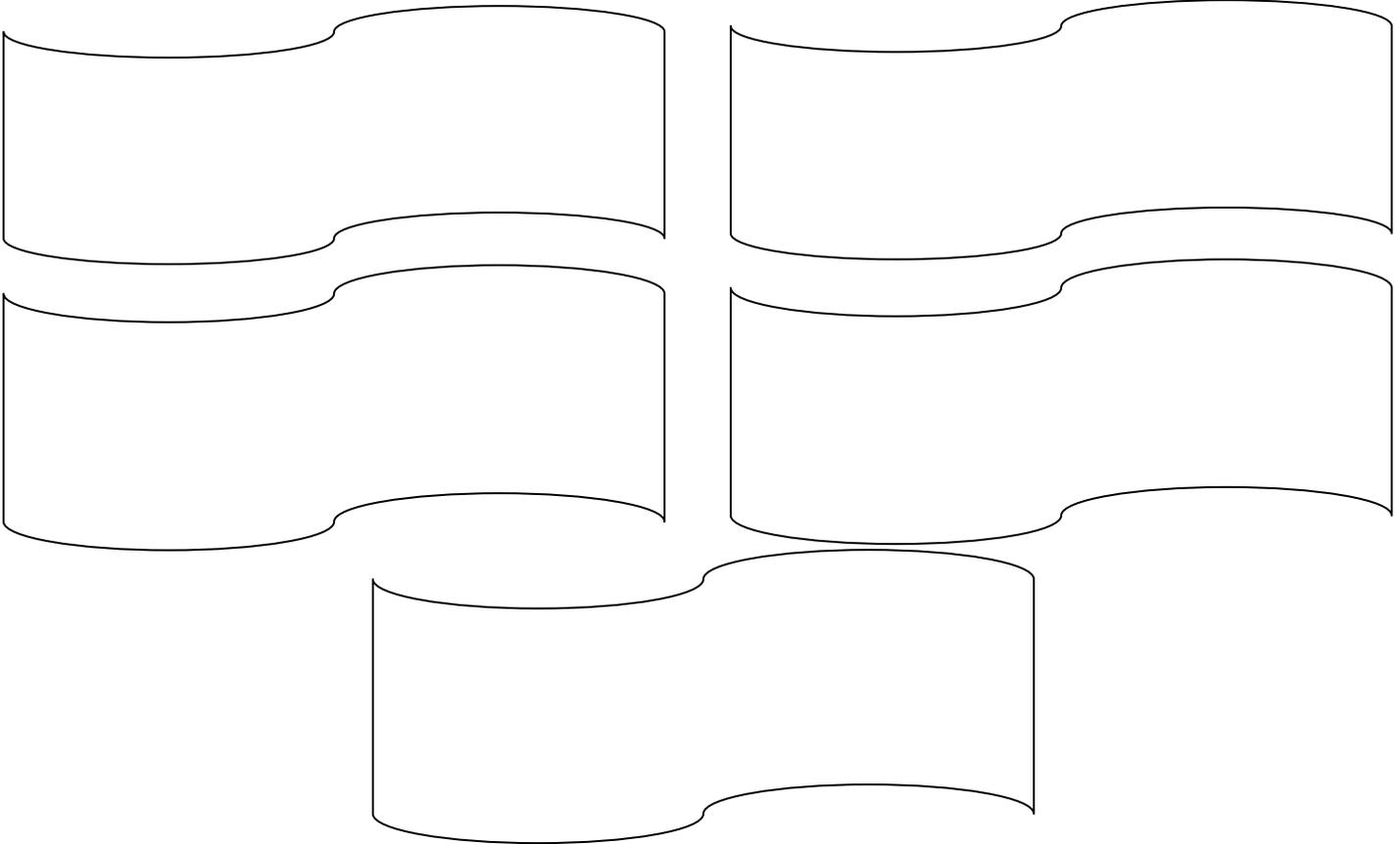
- 11) DNA acts as the blueprint or a _____ for a living thing.
- 12) _____ are referred to as the “building blocks of life.”
- 13) When combined together, amino acids form _____.
- 14) If proteins are the wrong shape, they do not _____.
- 15) _____ tells amino acids how to line up and form perfect protein shapes.
- 16) The chemical sequence of DNA is also known as its _____.
- 17) DNA lives in the center of the cell known as the _____.
- 18) Amino acids live outside the nucleus in what is called the _____.
- 19) The copies of DNA that get to leave the nucleus are called _____. *Note: These copies are made through a process called *transcription*.*
- 20) A special particle called a _____ reads the RNA and pulls in amino acids that combine and form a protein. *Note: This process is called *translation*.*

Adapted for viewing of [“What is DNA and How Does It Work?” by Stated Clearly](https://youtu.be/zwibgNGe4aY)
(<https://youtu.be/zwibgNGe4aY>)

Appendix 3

Lesson 1 Five Things to Know about Epigenetics

Directions: Look at the information boxes below. Five of them are true and describe epigenetics. Choose the correct five, cut, and paste them in the epigenetics diagram.



Epigenetic effects tell your DNA how much of it is expressed and when it should be expressed.	It is impossible for epigenetic information to be passed from parents to offspring. There is no way that epigenetics can explain the increase in occurrence of diseases like diabetes and cancer.
The genome is all the genetic information. The epigenome is methyl groups, histones, and other factors that influence what the genome does.	Methyl groups tell the DNA to turn “on” or “off” based on when and where they attach.
Nothing in the environment can influence our DNA. The DNA we are born with is the end-all and be-all for everything about us.	Some epigenetic information is passed down from parents to offspring (children). This could explain the increase in occurrences of diseases like diabetes and cancer.
Histones keep DNA wound loosely or tightly around them. When DNA is wrapped tightly, genetic information is expressed less. When DNA is wrapped loosely, genetic information is expressed more.	Epigenetics is only about allergies and a way to prevent swelling if you have an allergic reaction.

*Adapted for viewing of [“Epigenetics” by SciShow](https://youtu.be/kp1bZEUgqVI)-<https://youtu.be/kp1bZEUgqVI>

Appendix 4

Lesson 2 Letter-Writing Template

Date: _____

Legislator Name
Legislator District Address
Legislator District City, NC ZIP

Greetings _____,

My name is _____ and I am in the _____ grade at
_____ School. I am writing to share my thoughts about the
effects of lead on the brain. In class today, I learned that _____

_____.

I believe that it is important that you know this information because _____

_____.

_____.

I appreciate you taking the time to read about my thoughts. It is my hope that you will _____

_____.

_____.

Sincerely,

Scholar Name
School Address

Appendix 5

Lesson 3 Script Template

Hashtag/Slogan: # _____

Summary of PSA Concept: _____

Scene Heading	Action	Characters and Parentheticals	Dialogue Quick Notes
<i>Ex: INT-Classroom, Day time</i>	<i>Trenton sits at his desk fumbling with his Chromebook, which is yet again moving too slowly for him to log on.</i>	<i>Trenton Mrs. Mahoney Paulino (with a smile and a hint of sarcasm)</i>	<i>-Trenton says something about the slowness of the Chromebook -Mrs. MP makes a quick remark</i>

Use the notes you have made above to write a script for your PSA.

Notes

- 1 Hammond, *Culturally Responsive Teaching and the Brain*, 15
- 2 Hammond, *Culturally Responsive Teaching and the Brain*, 14
- 3 Moore, *The Developing Gene*, 5-6.
- 4 Moore, *The Developing Gene*, 40-42
- 5 Guerrero-Bosagna, "What is Epigenetics?"
https://www.youtube.com/watch?v=_aAhcNjmvhc&feature=youtu.be
- 6 Ruden, et. al., "Epigenetics of early-life lead exposure and effects on brain development"
- 7 Hopey, Don, "1,600 Days on Bottled Water: Flint Still Swamped by Water Woes"
- 8 Eleftheriou-Smith, "Being bilingual makes people's brains more efficient and could combat cognitive ageing, study finds"
- 9 Willis, "Bilingual Brains-Smarter and Faster"
- 10 Azupurua and Eaton, "Neuronal epigenetics and the ageing synapse"
- 11 American Anthropological Association, "AAA Statement on Race."
- 12 Achenbach, Joel, "Study Finds Africans More Genetically Diverse Than Other Populations"
- 13 Dweck, *Mindset*
- 14 1947 September, *The Reader's Digest*, Volume 51, Quote Page 64, The Reader's Digest Association.
- 15 *The Holy Bible*, Proverbs 23:7
- 16 Adapted from a quote found in: Galeano, *Open Veins of Latin America*, 5
- 17 <http://schottfoundation.org/restorative-practices>
- 18 New Oxford American Dictionary
- 19 Stated Clearly, "What is DNA and How Does it Work?", <https://youtu.be/zwibgNGe4aY>
- 20 SciShow, "Epigenetics," <https://youtu.be/kp1bZEUgqVI>
- 21 Girl Scouts Texas Oklahoma Plains, "How to Make a PSA," <https://youtu.be/eywBa0xfQFw>
- 22 Admin of Screencraft, "Elements of Screenplay Formatting,"
<https://screencraft.org/2015/05/07/elements-of-screenplay-formatting/>

Bibliography

- Achenbach, Joel. "Study Finds Africans More Diverse Than Other Populations." Washington Post. May 1, 2009. Accessed December 3, 2018.
This article sheds light on the genetic diversity on the African continent. It walks the reader through the rationale behind the idea that Africans are more genetically diverse than other populations of the world.
- Dweck, Carol S. *Mindset: The New Psychology of Success*. Ballantine Books. 2006
This book is about how a person's mindset can determine his/her levels of achievement. It is a great book for educators in that it provides strategies for reflecting on adult mindsets and helping students shift "fixed mindsets" to "growth mindsets."
- Eaton, Benjamin A. and Jorge Azpurua. "Neuronal epigenetics and the aging synapse." *Frontiers in Cellular Neuroscience*. 2015 May; 9: 208. doi: 10.3389/fncel.2015.00208
This is a scholarly article about synapses in the brain and the causes of strengthening and weakening the synapses.
- Galeano, Eduardo. *The Open Veins of Latin America*. Monthly Review Press. 1973
In this book, Galeano details how foreign involvement in the nations of Latin America have created the political, financial, and social situations which these nations are experiencing in present day.
- Guerrero-Bosagna, Carlos, "What is Epigenetics?"
<https://www.youtube.com/watch?v=aAhcNjmvhc&feature=youtu.be>
This is a short YouTube video that educators can use to give themselves or their students an overview of epigenetics.
- Hammond, Zaretta. *Culturally Responsive Teaching & the Brain*. Corwin. 2015
In this book, Dr. Hammond discusses how brain function benefits from culturally responsive teaching. Dr. Hammond provides rationale and strategies for implementing culturally relevant teaching into all classrooms.
- Helmut Hirsch, and Steven T. Suhr. "Epigenetics of early-life lead exposure and effects on brain development." *Epigenomics*. 2012 Dec; 4(6): 665-674 doi: 10.2217/epi.12.58
This is a scholarly article that discusses the effect of lead-exposure on children's brain development. The article has some graphics that could be used as quick-hit fact sheets for students.
- Hopey, Don, "1,600 Days on Bottled Water: Flint Still Swamped by Water Woes." Pittsburgh Post-Gazette. October 20, 2018. Accessed on December 4, 2018.
This article discusses the state of the water crisis in Flint, Michigan as of October 2018. The article is filled with a plethora of facts and takes a deep dive into the true inequities of the water crisis.

Moore, David S. *The Developing Genome: An Introduction to Behavioral Epigenetics*. Oxford University Press. 2015

This book served as the foundational text for the Nurturing Nature CTI seminar. The book provides scholarly knowledge about a variety of topics relating to epigenetics in a reader-friendly format.

Screencraft, "Elements of Screenplay Formatting." *Screencraft.org*. 2018

<https://screencraft.org/2015/05/07/elements-of-screenplay-formatting/>

This is a resource that defines the elements of a screenplay. This resource gives basic definitions that are student-friendly.

Ruden, Douglas, Marie-Claude Senut, Pablo Cingolani, Arko Sen, Adele Kruger, Asra Shaik, Eleftheriou-Smith, Loulla-Mae. "Being bilingual makes people's brains more efficient and could combat cognitive ageing, study finds." *Independent*. January 10, 2017. Accessed November 12, 2018. <https://www.independent.co.uk/news/science/bilingual-speak-two-languages-brain-more-efficient-combat-cognitive-ageing-study-universit-de-montr-a7519026.html>

This article describes the benefits of being bilingual. As the title suggests, two particular benefits according to the research cited are higher levels of brain efficiency and the possibility of combating cognitive aging.

Willis, Judy. "Bilingual Brains-Smarter & Faster." *Psychology Today*. November 22, 2012

Accessed November 12, 2018 <https://www.psychologytoday.com/us/blog/radical-teaching/201211/bilingual-brains-smarter-faster>

This article discusses the benefits of being bilingual and ties bilingualism to professional and social success. It cites research studies that could be utilized for students' research.