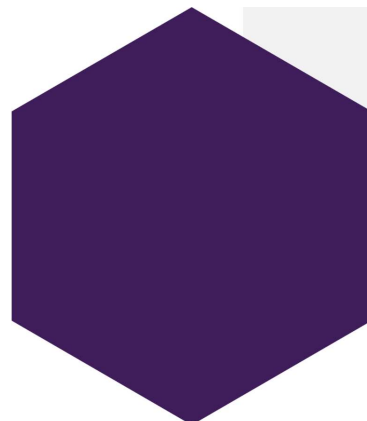
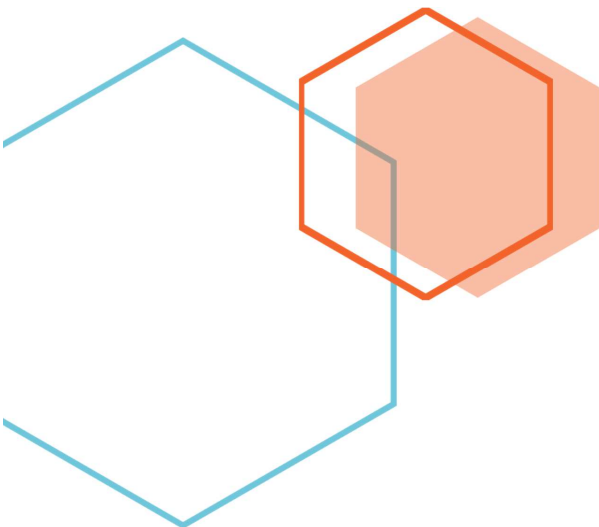




[Discovering Ethics]

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Middle Grades 6-9
July 2019

Conceptual Lens: Ethics
Essential Understanding: Ethics Governs Discovery
Essential Question: How Does Ethics Govern Discovery?



I. INTRODUCTION.....	2
A) RATIONALE.....	2
B) DIFFERENTIATION FOR GIFTED LEARNERS	3
C) POPULATION FOCUS	4
II. GOALS AND OUTCOMES	4
A) CONTENT GOALS.....	4
B) PROCESS GOALS	5
C) PRODUCT GOALS.....	6
III. ASSESMENT PLAN	6
IV. LESSON PLANS	8
A) LESSON ONE- BIOTECHNOLOGY RESEARCH	8
B) LESSON TWO- STEM CELL RESEARCH.....	14
C) LESSON THREE- SYNTHETIC EVOLUTION	22
D) LESSON FOUR- ARTIFICIAL INTELLIGENCE.....	30
V. UNIT RESOURCES.....	31

Discovering Ethics



Abstract

As new discoveries make our lives easier and more connected than ever, researchers can no longer claim science is neutral. Scientists must now must consider the ethical aspects of their work and ask, "Is this right?" The goal of this unit is to allow students to explore how ethics questions our values and the principles that govern our decisions through a scientific lens.

Rationale

There is a shift in education. Direct instruction, also known as the, "I Do, You Do, We Do" model is no longer the leading practice, as student centered methods are exponentially preparing scholars for the workforce and higher education institutes. Using student centered models that incorporate twenty-first century skills is important because, according to Forbes Magazine, "Close to 40 percent of employers could not find people with the right skills while 60 percent "complain[ed] of a lack of preparation(Kakoullis, 2019). " In a responsive attempt prepare scholars, this unit will encompass the four pillars of twenty-first century learning skills communication; collaboration; critical thinking; and creativity.

Students will have the opportunity to illustrate their communication skills during their presentations. Student presentations allow students to not only display their research but it also helps students develop critical public speaking skills, which will prove to be beneficial throughout life.

Students will work collaboratively to research and create projects that reflect their knowledge of the concept ethics. Collaboration is an important skill because it helps students achieve their goals while deepening their understanding.

Students will utilize critical thinking by exploring advanced conceptual topics. According to studies, middle students are more inclined to understand and retain concrete information and processes that are presented in sequential steps. Allowing gifted learners to build abstract conceptual understanding makes learning more rigorous and meaningful.

Rationale Continued

Learning is more meaningful when students are allowed to create. Allowing students to express their creativity is important because it gives them the opportunity to take control of their experience while creating a product that is reflective of their interest and understanding.

Differentiation For Gifted Learners

Differentiation is an instructional process in which teachers proactively accommodate curriculum to meet student growth needs (Anderson Algozzine, 2007). In this unit, the two leading forms of differentiation were content and process differentiation.

When an instructor differentiates content, the same concept or skill is taught to each student; however, the concept or skill might be taught differently to fit student needs based on student readiness, interest, or learning profile. This unit differentiated content based on student readiness by analyzing higher-level text with unique vocabulary and complex viewpoints; thus, making the content more rigorous. This unit differentiated content based on student interests by allowing them to pick and research a unique science topic. This unit differentiated content by learning profile by providing students the opportunity to interact with the curriculum in several different ways. Information is presented orally through lecture, discussion, and questioning. Information shown through picture/graphics, video, and other multimedia options. Information is modeled via labs, experiments, and demonstrations.

When an instructor implements process differentiation, the same concept or skill is taught to each student; however, how students acquire information varies to fit student needs based on student readiness, interest, or learning profile. In this unit, process differentiation is illustrated by using a variety of instructional models: Taba Model of Concept Development; Bruner's Structure of the Discipline; Socratic Seminar; Team-Based Learning. Each of the aforementioned models integrates rigor and depth. For example, The Taba Model of Concept Development promotes rigor by pushing students to participate in rich concept development through labeling grouping and regrouping. Students also develop abstract thoughts through open discussion and ended-questions. The Bruner's Structure of the Discipline Model promotes rigor and depth by giving students ownership of their learning experience by immersing them in an expert role. In this unit's rendition of the Bruner Model, students are asked to become a Biotechnology Researcher that is studying cellular growth conditions.

Differentiation For Gifted Learners Continued

In this unit, the Socratic Seminar Model, supports deep concept exploration through collaborative questioning by introducing the complex text, *How Humans Are Shaping Our Own Evolution*, by D.T. Max. After exploring the text, students are responsible for crafting questions that maintain the flow and integrity of the seminar discussion.

Population Focus

The section below explores the complexities of, gifted males, the population for whom the unit is intended.

→ **Socioeconomic Background-** Most gifted males come from the upper-middle class, but all socio-economic groups are included(Baker,2013).

→ **Interest-** According to the article, *Responding to the Needs of Gifted Boys*, published by The Minnesota Educators of the Gifted and Talented (MEGT), gifted males enjoy activities that incorporate spatial thinking strategies.

→ **Achievement-** Males are more likely to be gifted underachievers than females. This causes issues with identification because underachievement does not align with some of the common characteristics of giftedness such as longer attention span and intense concentration, rapid learner; puts thoughts together quickly, and excellent memory().

Goals and Outcomes

Content Goals and Outcomes

→ **Goal: To develop an understanding of how Biotechnology Research affects living organisms.**

→ **Students will be able to...**

- I. Describe the modern uses of biotechnology.
- II. Explain how biotechnology research affects us in every area of our lives: our food, water, medicine and shelter.
- III. Formulate a hypothesis, test their proposals, and collect authentic data.
- IV. Analyze data to determine similarities/differences and patterns amongst samples.

Discovering Ethics



→Goal: To develop an understanding of stem cells and their scientific uses.

→Students will be able to...

- I. Compare the features of a stem cell with a differentiated human body cheek cell.
- II. Describe the different types of stem cells, their harvesting techniques, and their scientific uses.
- III. Explain how President G.W. Bush 2001 policy affects stem cells and their scientific uses.

→Goal: To develop an understanding of how humans are expediting evolution with the use of technology via synthetic evolution.

→Students will be able to...

- I. Define and explain the term, evolution.
- II. Define and explain the term, synthetic evolution.
- III. Compare and contrast the definitions for evolution and synthetic evolution to identify their pros and cons.
- IV. Identify how Technology enables synthetic evolution.

→Goal: To understand Artificial Intelligence and its real world uses.

→Students will be able to...

- I. Define artificial intelligence.
- II. Examine the three types of artificial intelligence.
- III. Identify the applications of artificial intelligence.

Process Goals and Outcomes

→Goal: To develop critical thinking skills with application to science.

→Students will be able to...

- I. Develop observation skills.
- II. Utilize their observation skills to make accurate measurements.
- III. Students will analyze measurements to create and record a data set.
- IV. Recognize patterns in data, and use their findings to create a generalization of application results.

Discovering Ethics



→**Goal: To develop reasoning skills with application to science.**

→**Students will be able to...**

- I. Analyze informational text.
- II. Cite informational text as evidence to support analysis.
- III. Create, respond, and discuss higher level thinking questions with evidence, research, and analysis.

Concept Goals and Outcomes

→**Goal: To understand the concept of ethics.**

→**Students will be able to...**

- I. Interpret ethics as a set of moral obligations that define right and wrong in our practices and decisions.
- II. Analyze how ethical policy governs research discoveries and their use in science.
- III. Utilize their knowledge about ethics to develop a position on controversial research.

Assessment Plan

Please note: In an attempt to optimize the fluidity of my performance task (summative assessment), I subtly integrated a section into each lesson.

Lesson One

→**Formative Assessment:** Instructor observes classroom discourse and provides immediate verbal feedback as students submit verbal or written responses. From exploration lab and classroom discussion, the instructor will be able to determine each student's readiness and interest. At the end of lesson, students will be provided index cards. As a ticket out the door, scholars will be asked to respond to the final post lesson question, "How does ethics govern discovery?" Instructor will use response to track depth of understanding.

→**Performance Task:** Students will be asked to expand their knowledge on the ethics of biotechnology by completing independent research (attached in unit resource guide).

Lesson Two

→**Formative Assessment:** The instructor observes classroom discourse and provides immediate verbal feedback as students submit verbal or written responses. During the independent TBL quiz, the instructor is checking comprehension and the utilization of the close reading strategy. During the group TBL quiz, the instructor is checking to see how students collaboratively cite informational text as evidence to respond and discuss higher level thinking questions. As the class reviews each question, the instructor will allow groups to explain their reasoning, defend their answer choices, and challenge the responses

Discovering Ethics



of their peers. The instructor will address misconceptions at the group/individual level.

→**Performance Task:** Each group will present their policy to the class. As groups present, students will fill out a peer evaluation. The peer evaluation feedback will be used to revise and strengthen team policies.

Lesson Three

→**Formative Assessment:** Teacher acts as a silent facilitator during the Socratic seminar; only interjecting when necessary. Students will evaluate themselves as well as their peers use a rubric (*attached in unit resource guide-Socratic Seminar Rubric*).

→**Performance Task:** Students will work independently to construct a web diagram / concept map. The concept map should depict strong analysis and scholars should cite the text, *How Humans Are Shaping Our Own Evolution*, by D.T. Max, as they express conclusions/generalization. Maps should illustrate the relationship between concepts related to synthetic evolution as it pertains to ethics, technology, and discovery. The instructor will encourage students to include vocabulary from prior lessons (*attached in unit resource guide-Concept Map Rubric*).

Lesson Four

→**Formative Assessment:** Instructor will monitor throughout the room as students work in groups. As students complete their compilations, the teacher will instruct students to label the categories so that each section illustrates how the words/phrases relate to the concept, ethics. Students will be asked to describe the similarities and differences between categories. Students will also be asked to justify their category labels and their reasons for grouping with the class.

→**Performance Task:** Evaluation of Performance Task Rubric (*attached in unit resource guide-Performance Task Rubric*).

Lesson Plans

TEACHER NAME		Lesson #
Ms. Sonya West		1
MODEL	CONTENT AREA	GRADE LEVEL
Bruner	Science	Middle Grades
CONCEPTUAL LENS		LESSON TOPIC
Ethics		The Scientific Method-Biotechnology Research
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
<u>Science Standards</u> 8.L.2 Understand how biotechnology is used to affect living organisms. Summarize aspects of biotechnology including: A) Specific genetic information available B) Careers C) Economic benefits to North Carolina D) Ethical issues MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. <u>Literacy Standards</u> SL.8.1 Engage effectively in a range of collaborative discussions (one on one, in groups, and teacher-led) with diverse partners on grade topics, texts, and issues building on others' ideas and expressing their own clearly. A) Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. B) Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. C) Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. D) Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.		
THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to "uncover" the Essential Understanding)</i>
Ethics governs discovery.		How does ethics govern discovery?

Discovering Ethics



CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	PROCESS SKILLS (What will students be able to do as a result of this lesson?)
→Students will know that ethics are a set of moral obligations/rules that define right and wrong in our practices and decisions. →Students will know that discovery is defined as, "the act of finding or learning something for the first time (Merriam-Webster, 2019)." →Students will know that a scientist must consider the ethical aspects of their work (discoveries). →Students will know the tools and lab resources used in biotech research. →Students will know that biotechnology involves the use of living cells and their molecules to solve problems and make useful products. →Students will know the three basic strands of biotechnology research are: →working with cells →working with proteins →working with genes. →Students will know that the uses of modern biotechnology include: →Making medicine in large quantities (e.g. penicillin) and human insulin for the treatment of diabetes. →Combating crime through DNA testing and forensic testing. →Improving the quality of agricultural crops and livestock products. →Students will know that some new areas such as Genetic Modification (GM) and cloning are ethically controversial. →Students will know that the scientific method: →Make an observation. →Ask a question. →Form a hypothesis. →Make a prediction based on the hypothesis. →Test the prediction. →Analyze the results to make new hypotheses or predictions. →Students will know how use the scientific method to generate data to test ideas about designed systems, including those representing inputs and outputs.	→Students will be able to predict. →Students will be able to observe. →Students will be able to analyze. →Students will be able to evaluate. →Students will be able to use scientific tools. →Students will be able to work collaboratively. →Students will be able to create generalizations. →Students will be able to collect and cite research as evidence to support analysis.

Discovering Ethics



GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding</i>			
Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:	
→Why do we have rules? →How could rules(ethics) impact discovery? →What type of rules(ethics) would a scientist have to follow? →What are some methods that scientist use to collect information? →What are some tools that scientist use?	→What is biotechnology? → What are the modern uses of biotechnology? →What tools do scientist use to conduct biotech research? →What is the scientific method? →How is the scientific method used in Biotechnology? →What are ethics? →Why would biotech research be considered unethical? →How does	→How did you use the scientific method to generate your data? →How did your hypothesis/ change through the course of your research? →What are some tools/pieces of equipment that you used today? →How are the tools in Biotechnology used to promote discovery ? →How does ethics govern discovery? →What are the ethical pros and cons of using biotechnology to create medicine? →What are the ethical pros and cons of using biotechnology to promote agriculture? →What are the ethical pros and cons of using biotechnology promote sustainability?	

Discovering Ethics



DIFFERENTIATION (Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.)			
Content	Process	Product	Learning Environment
Scholars will unpack higher level research topics with unique vocab and complex view point.	Scholars will explore and implement research methods that are above grade level.		

PLANNED LEARNING EXPERIENCES (What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)
Engage and Connect - As students enter the classroom, the word, "Rules", will be posted on the Brightlink projector. Students will be instructed to take a moment to independently reflect on the word and its possible uses. As students quietly reflect, the instructor will give each scholar an iPad with the website, www.polleverywhere.com, pre-loaded. Polleverywhere is an interactive tool that invites scholars to explore and reflect on topics. Once the link goes live, scholars will use their iPad's to post their opinions on the word, rule. Posted answers will move and grow to create a word cloud; commonly submitted answers are projected in large bold font. The instructor will ask scholars to elaborate on their responses. The link that scholars will use during Spark Camp can be found here. A sample word cloud is posted below. Once the conversation starts to wane, the instructor will ask the following pre-lesson question: → Why do we have rules? → How could rule(ethics) impact discovery? → What type of rules(ethics) would a scientist have to follow? → What are some methods that scientist use to collect information? → What are some tools that scientist use? After the pre-lesson dialogue, the instructor will introduce our guest speaker, Dr. Amanda Marvelle. Dr. Marvelle works as the community lab director for the largest North Carolina

Discovering Ethics



Biotechnology company, Biogen. Biogen specializes in cellular research and medical and agricultural bioengineering products.

Explore –

The presenter, Dr. Marvelle, will introduce the topic of biotechnology via PowerPoint presentation. Through Dr. Marvelle's showcase, scholars will develop an understanding of the following: how to define biotechnology; the tools and lab resources used in biotech research; The modern uses of biotechnology; and the ethical implications of biotech research.

After the short presentation, students will be divided into groups. The instructor tells scholars that they are now biotechnology researchers. The instructor will then read students the following prompt, "Biogen has hired you all to help engineer a new medicine. Your goal is to find the optimal temperature for cellular growth so that the medicine can be quickly mass produced. In order to ensure accuracy, you'll be asked to record your observations, data, and generalizations on a formal lab handout."

Materials for each table:

Transfer Pipettes (2)
Dish washing soap
Hyclone
50 ml tube filled with 25ml of water (3 per pair).

Scientific method via Biotechnology Research Lab:

- 1) Observe/Ask a question: Students will start their scientific research by brainstorming all the things that cells need to grow. Students will record responses on their lab sheet.
- 2) Form a hypothesis/make a prediction: students will be asked to hypothesize and predict which temperature is best for cells. Students will record responses on their lab sheet.
- 3) Test the hypothesis: students will visually observe the yeast cells at each temperature. The cloudier the cell culture, the more cells are present. Students will record responses on their lab sheet.
- 4) Analyze the results: students will be asked to answer the following question, "based on your data and observation which temperature provided the most cell growth? Explain using your evidence from the data tables"

(Although scholars are working in groups, each student will be asked to completed their own lab sheet.)

Explain -

After all groups have completed their research lab, students will share their findings. Each group will be asked share original hypothesis and ending conclusions. After the discussion, the teacher will ask the post lesson questions. Students will orally respond.

Post lesson questions:

- How did you use the scientific method to generate your data?
- How did your hypothesis/ change through the course of your research?
- What are some tools/pieces of equipment that you used today?
- How does ethics govern discovery?

Discovering Ethics



Elaborate—

Students will be asked to expand their knowledge on the ethics of biotechnology by completing independent research. Students will use iPad to aide their search.

Branch of Biotechnology	Pros	Cons	Impact on NC
Medicine	1.	1.	
	2.	2.	
Agriculture	1.	1.	
	2.	2.	
Sustainability	1.	1.	
	2.	2.	

2. Complete the chart below. **(The answer below will vary. This is a sample.)**

Branch of Biotechnology	Pros	Cons	Impact on NC
Medicine	1. Can be used to screen for possible diseases. 2. Creation of medicines and drugs that are used to cure or treat a variety of diseases that were once deadly.	1. Ethical issues in regards to many areas such as cloning. 2. Unknown long term effects.	RTP is one of the largest research parks in the United States. This attracts many companies to the area which increases jobs and economy in NC.
Agriculture	1. Can help to reduce the use of chemical pesticides by creating insect resistant crops. 2. Larger crop yields and larger foods will help with the growing population and hunger issues around the world.	1. Decrease in biodiversity of plants. 2. Unknown long term effects.	Some of the world's largest agricultural companies are located in NC. This also increases job opportunities and increases the financial gains of the state by increasing crop yields.
Sustainability	1. Reduce the use of fossil fuels. 2. Help to create renewable energy sources that will reduce climate change and pollution.	1. Expensive 2. Lack of space/resources that can be used as alternative fuel sources.	Over the past decade clean energy initiatives in NC have helped to reduce electric bills, increase jobs, and provide us with clean, safe power sources.

Evaluate:

Students will be provided index cards. As a ticket out the door, scholars will be asked to respond to the final post lesson question, "How does ethics govern discovery?"

Discovering Ethics



TEACHER NAME		Lesson #
Ms. Sonya West		2
MODEL	CONTENT AREA	GRADE LEVEL
Team Based Learning	Science	7
CONCEPTUAL LENS		LESSON TOPIC
Ethics		Stem Cell Research
LEARNING OBJECTIVES (from State/Local Curriculum)		
<u>Content Standards</u> 7.L.1.3- Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. <u>Literacy Standards</u> RI.7.1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.7.2 Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text. SL.7.1 Engage effectively in a range of collaborative discussions (one on one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. A) Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. B) Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. C) Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. D) Acknowledge new information expressed by others and, when warranted, modify their own views.		
THE ESSENTIAL UNDERSTANDING (What is the overarching idea students will understand as a result of this lesson?)		THE ESSENTIAL QUESTION (What question will be asked to lead students to "uncover" the Essential Understanding)
Ethics governs discovery.		How does ethics govern discovery?

Discovering Ethics



CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	PROCESS SKILLS (What will students be able to do as a result of this lesson?)
→Students will know that ethics are a set of moral obligations that define right and wrong in our practices and decisions. →Students will know how ethical politics have governed stem cell discoveries and their use in medicine; specifically noting, President George W Bush's Federal Law issued in 2001. →Students will know that a cell the smallest unit of life. →Students will know that a stem cell is a type of cell that grow/change into many different types of body cells (cardiac cells, cheek cells, nerve cells, etc). →Students will know that the aforementioned process is called cellular differentiation. →Students will know that stem cells can be taken from umbilical cord blood, bone marrow, or some organs. →Students will know that Pluripotent Stems Cells are master cells that are able to make and repair any cell or tissue. →Students will know that regenerative medicine is a branch of medicine that seeks to replace this fact of body parts with new bioengineered ones.	→Students will be able to analyze informational text. →Students will be able to cite informational text as evidence to support analysis. →Students will be able to break down textual information to see interrelationships. →Students will be able to create, respond, and discuss higher level thinking questions. →Students will be able to create generalizations. →Students will be able to work collaboratively.

Discovering Ethics



GUIDING QUESTIONS What questions will be asked to support instruction? Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding		
Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:

→ What are ethics? → What are some examples of a time where you've had to make an ethical decision? → What role does ethics play in discovery? → What is a policy? → How does policy affect stem cell discoveries?	→ Which best describes stem cells? A) Differentiation creates specialized cells from stem cells. B) Self-renewal creates stem cells from differentiated cells. C) Self-renewal creates differentiated cells from stem cells. D) Differentiation creates stem cells from specialized cells. → Which best describes an undifferentiated cell? A) A kind of stem cell B) A cell without characteristics specific to a kind of tissue C) Another term for a tissue-specific stem cell D) Another term for a pluripotent stem cell → Which best describes a differentiated cell? A) A kind of stem cell B) A cell without characteristics specific to a kind of tissue C) Another term for a tissue-specific stem cell D) Another term for a pluripotent stem cell → What is the difference between a cheek cell and a stem cell? A) Cheek cells are undifferentiated and stem cells are differentiated. B) Cheek cells are differentiated and stem cells are undifferentiated. C) Cheek cells form embryonic cells and stem cells form from blood cells. D) Cheek cells form from blood cells and stem cells form from blood cells embryonic cells. → Which best describes how Pluripotent stem cells are different from adult stem cells in what way? A) They are not available for use with humans B) They cannot be used in treatments for adults C) They can only become a few kinds of cells in the body. D) They can become any kind of cell type in the body → The process of stem cells to replacing damaged bodily tissue is	→ How do you think ethics governs stems cell research? → What are some examples of how US ethical policies have shaped stem cell research and their use in medicine? → Why would stem cell research be viewed as an ethical dilemma? → How have your personal ethics shaped your opinion on stem cell research? → How does ethics govern discovery?
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Discovering Ethics



	called? A) Regenerative medicine B) Cloning C) Genetic engineering D) Gene splicing → Where are stem cells harvested? A) Stem cells are only harvested from embryos. B) Stem cells are only harvested from tissues in the body. C) Stem cells are only harvested from the brain. D) Stem cells are only harvested from an embryo or tissues in the body. → What are the roles of stem cells in our bodies? A) We are not sure what roles stem cells play in the body B) They produce new specialized cells to replace cells that die or are used up C) They fight against infections D) They perform specialized roles in the body (e.g. produce insulin, transmit signals in the nervous system, ...) → What are stem cell discoveries scientists investigating today? A) When and how embryonic stem cells make decisions to produce more specialized cells B) How stem cells work in the body C) How stem cells might be used to treat disease D) All of the above → What ethical policy did George W Bush pass into law in 2001? A) George W Bush's policy ended all stem cell research. B) George W Bush's policy ended stem cell research and prevented it from being privately funded. C) George W Bush's policy allowed stem cell research but limited its federal funding. D) George W Bush's policy allowed stem cell research and fully funded the initiative.	
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>		
Content	Process	Product
		Learning Environment

Discovering Ethics

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Students will explore to higher level text with unique vocab and complex view point.		Students will work together to create to policy based on their individual interest and overall group consensus.	
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PLANNED LEARNING EXPERIENCES

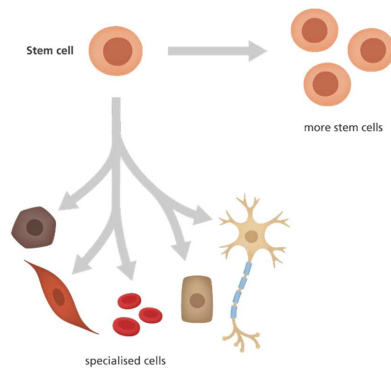
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect -

The instructor will say:

"Cells, the smallest unit of life, are the building blocks that the body needs to perform. When an organism is developing, most cells develop a specific function. Some cells become blood cells, cardiac cells, etc; however, during development, some cells do not develop a specialized function. Stem cells or cells without a specialized function can be used to replaced damaged or dead cells. In order for you to observe the commonalities between specialized cells and unspecialized cells (stem cells), we will harvest and observe cheek cells." Cheek cells, which can be obtained by scrapping the inside of the mouth with a toothpick, are thin and flat which makes them q0uick and easy to observe. The cheek cell learning activity gives scholars a hands on opportunity to observe specialized body cells.

After the observation the instructor will post, Figure 1, variety of cell structure.



The instructor will ask, "Why do you think the appearance of cheek cells (specialized cells) varies from a stem cell?"

Student answers may include: Cells have different functions or the cells look differently because of make different proteins. The instructor will then introduce students to the conceptual lens, ethics, by asking the following pre-lesson questions:

Discovering Ethics



What are ethics?

What are some examples of a time where you've had to make an ethical decision?

Once the pre-lesson discussion is completed, the instructor will show a short stem cell video. Information about stem cells will be reinforced with the article, "The Stem Cell Divide" by Rick Weiss. Students may choose to read alone or select a partner from their table. After the aforementioned activities, the instructor will then ask the remaining pre-lesson question:

What role does ethics play in discovery?

Why would stem cell research be viewed as an ethical dilemma?

<https://www.youtube.com/watch?v=evH0l7Coc54>

<https://www.nationalgeographic.com/science/health-and-human-body/human-body/stem-cell-divide>

Explore -

The teacher will hand out a short quiz. As the teacher cycles through the classroom, they will instruct students to work independently. Before students begin, the teacher will explain that the quiz is non-evaluative but they should strive to choose the best answer. After ten minutes, the teacher will instruct students to get back in their learning groups. Once students are back in their learning groups, the teacher will direct students to review each question and form consensus. After a consensus is reached, student will take out their tablets to play Quizlet LIVE. Quizlet LIVE is a fun and interactive team game that will allow students record their team responses. Quizlet LIVE also allows students to compare their answers with other learning groups.

Discovering Ethics



Quiz Questions:

→ Which best describes stem cells?

- A) Differentiation creates specialized cells from stem cells.
- B) Self-renewal creates stem cells from differentiated cells.
- C) Self-renewal creates differentiated cells from stem cells.
- D) Differentiation creates stem cells from specialized cells.

→ Which best describes an undifferentiated cell?

- A) A kind of stem cell
- B) A cell without characteristics specific to a kind of tissue
- C) Another term for a tissue-specific stem cell
- D) Another term for a pluripotent stem cell

→ Which best describes a differentiated cell?

- A) A kind of stem cell
- B) A cell without characteristics specific to a kind of tissue
- C) Another term for a tissue-specific stem cell
- D) Another term for a pluripotent stem cell

→ What is the difference between a cheek cell and a stem cell?

- A) Cheek cells are undifferentiated and stem cells are differentiated.
- B) Cheek cells are differentiated and stem cells are undifferentiated.
- C) Cheek cells form embryonic cells and stem cells form from blood cells.
- D) Cheek cells form from blood cells and stem cells form from blood cells embryonic cells.

→ Which best describes how Pluripotent stem cells are different from adult stem cells in what way?

- A) They are not available for use with humans
- B) They cannot be used in treatments for adults
- C) They can only become a few kinds of cells in the body.
- D) They can become any kind of cell type in the body

→ The process of stem cells to replacing damaged bodily tissue is called?

- A) Regenerative medicine
- B) Cloning
- C) Genetic engineering
- D) Gene splicing

→ Where are stem cells harvested?

- A) Stem cells are only harvested from embryos.
- B) Stem cells are only harvested from tissues in the body.
- C) Stem cells are only harvested from the brain.
- D) Stem cells are only harvested from an embryo or tissues in the body.

→ What are the roles of stem cells in our bodies?

- A) We are not sure what roles stem cells play in the body
- B) They produce new specialized cells to replace cells that die or are used up
- C) They fight against infections
- D) They perform specialized roles in the body (e.g. produce insulin, transmit signals in the nervous system, ...)

→ What are stem cell discoveries scientists investigating today?

- A) When and how embryonic stem cells make decisions to produce more specialized cells
- B) How stem cells work in the body
- C) How stem cells might be used to treat disease
- D) All of the above

→ What ethical policy did George W Bush pass into law in 2001?

- A) George W Bush's policy ended all stem cell research.
- B) George W Bush's policy ended stem cell research and prevented it from being privately funded.
- C) George W Bush's policy allowed stem cell research but limited its federal funding.
- D) George W Bush's policy allowed stem cell research and fully funded the initiative.

Explain -

The instructor will stream the Quizlet LIVE results on the board in real-time so that misconceptions can be easily addressed. As the class reviews each question, the instructor will allow groups to explain their reasoning, defend their answer choices, and challenge the responses of their peers. The instructor will address misconceptions at the group/ individual level.

Discovering Ethics



Elaborate —

Students are informed that they will create their own Stem Cell Policy. The policy will be created based on their learning group's ethical opinion of stem cell research. The teacher will post the following slide on the board:

Choose one of the options below and finish the sentence to make your own group policy.

1. No embryos should ever be used because...

2. Embryos should only be used if...

3. All embryonic stem cell research is okay because...

We think this because... (The teacher should remind students to find concrete examples and factual information to defend their policy.)

At this point the instructor will ask, "what are some examples of how politics have shaped stem cell research and their use in medicine?" Depending on answers, the instructor will remind students of the President George W Bush's 2001 policy that they learned from the text, "The Stem Cell Divide" by Rick Weiss. The teacher will give students an iPad so that they can research current policy and how stem cells are used to treat disease. Each group will present their policy to the class. As groups present, students will fill out a peer evaluation. The peer evaluation feedback will be used to revise and strengthen team policies.

Evaluate:

The instructor will close the lesson by asking students the following post lesson questions:

How do you think ethics governs stem cell research?

What are some examples of how ethical standards have shaped stem cell research and their use in medicine?

How have your personal ethics shaped your opinion on stem cell research?

How does ethics govern discovery?

Teacher will ask questions in a whole group setting.

Discovering Ethics



TEACHER NAME		Lesson #
Ms. Sonya West		3
MODEL	CONTENT AREA	GRADE LEVEL
Socratic Seminar	Science	Middle Grades
CONCEPTUAL LENS		LESSON TOPIC
Ethics		Synthetic Evolution
LEARNING OBJECTIVES (from State/Local Curriculum)		
<u>Content Standards</u> 7.L.2.3-Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival. 8.L.4 Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time. <u>Literacy Standards</u> RI.7.1 Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. RI.7.2 Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text. SL.7.1 Engage effectively in a range of collaborative discussions (one on one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. E) Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. F) Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. G) Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. H) Acknowledge new information expressed by others and, when warranted, modify their own views.		
THE ESSENTIAL UNDERSTANDING		THE ESSENTIAL QUESTION
(What is the overarching idea students will understand as a result of this lesson?)		(What question will be asked to lead students to "uncover" the Essential Understanding?)
Ethics governs discovery.		How does ethics govern discovery?
CONTENT KNOWLEDGE		PROCESS SKILLS
(What factual information will students learn in this lesson?)		(What will students be able to do as a result of this lesson?)
→Students will know that the theory of evolution explains changes in life on Earth over time. →Students will learn that biological evolution explains the diversity of species that have developed through gradual processes over many generations. →Students will know that one's environment and lifestyle choices affect survival and evolution. →Students will know that humans are bypassing evolution's natural process by using technology to synthesize supergenes. →Students will know that supergenes are properties that can make plants and animals resistant to		→Students will be able to analyze informational text. →Students will be able to cite informational text as evidence to support analysis. →Students will be able to break down textual information to see interrelationships. →Students will be able to create, respond, and discuss higher level thinking questions. →Students will be able to create generalizations. →Students will be able to work collaboratively. →Students will be able to create a concept map that shows the relationship between ethics and synthetic evolution.

Discovering Ethics



disease, mutations, and other biological properties that developed through gradual processes over many generations; thus, synthesizing evolution. →Students will know that ethics are a set of moral obligations that define right and wrong in our practices and decisions. →Students will know the ethical pro's to synthesizing evolution: i. Longer lifespans ii. Eradicating disease iii. Increase profits →Students will know the ethical con's to synthesizing evolution: i. Superbugs and viruses that are resistant to antibiotics and other drugs ii. Unequal distribution and access to synthesizing technology by race/class. iii. Overpopulation		
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding</i>		
Pre-Lesson Questions: →How is discovery depicted in the image? →How might humans be affected by the discovery depicted in the image? →How would you define ethics? →How did the director display ethics in this scene? →How could ethics affect the discovery depicted in the image? → What is the role of technology in this image?	During Lesson Questions: → From the seminar, what was one generalization that you discovered? →How did the seminar influence your thinking about the lesson topic or the text? → What is one idea, comment or question you heard someone share during the seminar that stuck with you? →What challenges did you experience or observe during the seminar?	Post Lesson Questions: →What is evolution? / What does it mean to evolve? →What are some examples of evolution? → How is technology redefining how earth evolves? →What could be the result of using technology to manipulate evolution? →What are some discoveries that were stated in the text? → How were the discoveries in the text used to synthesize evolution? → What is the relationship between ethics and synthetic evolution?
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>		
Content Scholars will analyze higher level text with unique vocabulary and complex viewpoints; thus, making the content more rigorous.	Process Scholars will facilitate a Socratic seminar. Scholars will be responsible for crafting questions that maintain the flow and integrity of the seminar.	Product
		Learning Environment Scholars will have the opportunity to work to in the following learning environments: independently, small group, and seminar.

Discovering Ethics



PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect : Virtual Thinking Strategies

As scholars enter the classroom, the instructor places an image from the movie, *What Happened to Monday?*, on the brightlink. The instructor asks students to silently observe the picture. The instructor allows students to observe the image in silence for three minutes.



After three minutes, the instructor prompts students with the following intro, "For our opening activity, we are going to review an image and discuss our observations. There are no right or wrong answers." The instructor then asks, "What's going on in this image? What do you see that makes you say that? What else do you see? . The instructor will cycle through the aforementioned questions until generalizations are formed and/or once student responses become repetitive. After the opening inquiry, the instructor will then transition the discussion by asking the following pre-lesson questions:

- How is discovery depicted in the image? What do you see that makes you say that?
- How might humans be affected by the discovery depicted in the image? What do you see that makes you say that?
- How would you define ethics?
- How did the director display ethics in this scene? What do you see that makes you say that?
- How could ethics affect the discovery depicted in the image?
- What is the role of technology in this image? What do you see that makes you say that?

Explore - In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.

Scholars will each be provided a copy of, *How Humans Are Shaping Our Own Evolution*, by D.T. Max. Scholars will be instructed to read the first three pages silently. After completing the initial reading, the instructor will introduce the close reading strategy. The instructor will facilitate the close reading strategy with the whole class for the first three pages, so that scholars can become familiar with the technique. Scholars will then be placed into groups of two and will be asked to read the remaining pages; scholars should continue to employ the close reading strategy. Student groups should create three seminar questions. The questions will be used in partnership with the questions created in the close reading to facilitate Socratic discussion.

Explain - Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.

In order to prepare for the seminar, scholars will be divided into two groups, the Socratic inner circle and the Socratic outer circle. The inner circle starts the discussion while the outer circle observes, take notes, and

Discovering Ethics



constructs questions that arise from the prevailing seminar. Scholars from the outside circle will observe and evaluate one student from the inner circle. The instructor will start the seminar with the following question, *how does ethics govern discovery?*

The inner circle will maintain discourse for ten minutes. After ten minutes, the inner and outer will switch roles. The new outer circle will now observe, take notes, and crafts questions that arise from the prevailing seminar.

Once both groups have completed the seminar, the teacher ask the following questions:

- From the seminar, what was one generalization that you discovered?
- How did the seminar influence your thinking about the lesson topic or the text?
- What is one idea, comment or question you heard someone share during the seminar that stuck with you?
- What challenges did you experience or observe during the seminar?
- What is the relationship between ethics and synthetic evolution?

Elaborate —Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

Once scholars have completed their task, the instructor will ask the following post lesson questions:

- What is evolution? / What does it mean to evolve?
(Scholars should attempt to cite textual examples. Student answers will vary)
- What are some examples of evolution?
(Scholars should attempt to cite textual examples. Answers may include: Greenland natives have an adaptation that helps them digest the omega-3 fatty acids in fish; An indigenous Argentine population has evolved to be able to drink the high levels of arsenic that have occurred naturally in their groundwater; Our early ancestors may have adapted to walking on two legs as an efficient way to travel long distances, possibly to find new kinds of food; Some African Americans have a gene that protects them against malaria.)
- How is technology redefining how earth evolves?
(Student answers may include: Scientists genetically engineer foods like tomatoes to grow faster; Scientist have engineered vaccines and drugs to help extend the human life expectancy; Longer life expectancies could lead to food scarcity and overpopulation. If the aforementioned answer is presented, students should reference text and the image from the film, *What Happened to Monday*, that was shown in the engage and connect section. The teacher will pay close attention to how students ethically challenge the pros and cons of synthetic evolution via technology. The instructor will listen to student feedback to help guide the discussion so that all of the base answers are covered as it helps frame the upcoming tasks.)
- What could be the result of using technology to manipulate evolution?
(Scholars should attempt to cite textual examples. Answers may include: Technology can help genes evolve does much faster; Scientist can select or engineer the best traits to help bolster our physical skills, widen our intellectual, and allow us to expand into new and more challenging environments. We have created medicines today to combat infectious diseases, but virulent bacteria have recently evolved that do not respond to antibiotics---Superbugs. Student answers may also allude to the units' conceptual lens, ethics. Answers may include the unfair access to genetic engineering do to race/ socioeconomic status or religious preferences.)
- What are some discoveries that were stated in the text?
(Scholars should attempt to cite textual examples. Student answers will vary)
- How were the discoveries in the text used to synthesize evolution?
(Scholars should attempt to cite textual examples. Student answers will vary)

Discovering Ethics



Evaluate: This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.

Students will work independently to construct a web diagram / concept map. The concept map should depict strong analysis and scholars should cite the text, *How Humans Are Shaping Our Own Evolution*, by D.T. Max, as they express conclusions/generalization. Maps should illustrate the relationship between concepts related to synthetic evolution as it pertains to ethics, technology, and discovery. The instructor will encourage students to include vocabulary lessons from prior lessons.

Concept Map Rubric	1	2	3
Position: stated and included it in the appropriate place in the paper, was thoroughly supported throughout the paper.			
Reasoning: well developed and thought out reasons. Reasons show strong analysis and conclusions based on the information.			
Depth: Position is supported in depth with a variety of sources. Substantial valid and accurate information in the form of expert opinion, statistics, research studies, etc. has been used			

Discovering Ethics



TEACHER NAME		Lesson #
Ms. Sonya West		4
MODEL	CONTENT AREA	GRADE LEVEL
Taba	Science	Middle Grades
CONCEPTUAL LENS		LESSON TOPIC
Ethics		Artificial Intelligence
LEARNING OBJECTIVES (from State/Local Curriculum)		
Content Standards 7.L.1- Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.3- Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms. 7.L.2.3- Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival. Literacy Standards ELA-LITERACY.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. CCSS.ELA-LITERACY.RST.6-8.5 Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.		
THE ESSENTIAL UNDERSTANDING (What is the overarching idea students will understand as a result of this lesson?)		THE ESSENTIAL QUESTION (What question will be asked to lead students to "uncover" the Essential Understanding)
Ethics governs discovery		How does ethics govern discovery?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)		PROCESS SKILLS (What will students be able to do as a result of this lesson?)
Students will know that artificial intelligence has been used to advance medicine by designing treatment plans and aiding doctors in surgery. Students know that there are three types of artificial intelligence. Students will know that touring test is used to distinguish between human intelligence and artificial intelligence. Students will know the pro and cons for using artificial in warfare: Fewer casualties, safer warfare, etc.		Students will be able to break down textual information to see interrelationships. Students will be able to discuss and respond to higher level thinking questions. Students will be able to list, categorize, and regroup items by attribute. Students will be able to create generalizations. Students will be able to make connections.

Discovering Ethics



GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding</i>			
Pre-Lesson Questions: What is artificial intelligence? How do you distinguish between artificial intelligence and human intelligence? What are the various areas where AI (Artificial Intelligence) can be used? How do you think ethics governs AI usage?	During Lesson Questions: What types of article intelligence are listed in the article? What type of ethical issues are described in the text? What words/phrase might go together as it relates to ethics? What belongs together? On what criterion? How would you call these groups? What generalization might you make after reading how ethics governs discovery?	Post Lesson Questions: How can we ethically regulate AI usage? In what ways can AI can be used to promote discovery? What is the relationship between ethics and discovery? How does ethics govern discovery?	
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>			
Content The selected article explores advanced conceptual topics. According to studies, middle students are more inclined to understand and retain concrete information and processes that are presented in sequential steps. Allowing gifted learners to build abstract conceptual understanding makes	Process Students will think critically as they analyze the conceptual lens, <i>ethics</i>, through labeling, grouping, subsuming, and regrouping. For this assignment, I will provide individualized rubrics--- rubrics were modified to reflect student ability. Along with rubric, gifted learners will also have	Product	Learning Environment

Discovering Ethics



learning more rigorous and meaningful.	to self-evaluate their final generalization and overall process for grouping.		
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PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.

To engage students, the teacher will show students a short clip about the artificial intelligence, Sophia. Before showing the clip, the teacher will explain that Sophia is not a robot; in fact, Sophia has been granted citizenship in countries such as Saudi Arabia. Sophia can also read books, walk, make decisions without being prompted and is even learning how to drive. After the clip students, the teacher will ask students, "Sophia has been granted citizen for Saudi Arabia and could potentially be given the right to vote. Should she be given the same rights and responsibilities as people? Students will briefly white-board their ideas before sharing them via whole class discussion. After the discussion, the teacher will show a short clip that will showcase how artificial intelligence is being using in our world, with specific regards to healthcare and warfare.

<https://youtu.be/LguXfHKsa0c>

Explore —

Listing

Students will read the article, *Artificial intelligence should take ethics into account*, which will showcase how ethical regulations govern how artificial intelligence is being using in our world. As students read the article, they will be asked to list words or phrases that describe or relate to the concept ethics. As students share their lists, the teacher will compile responses on the board; students will not be permitted to include the words artificial intelligence on their list.

Explain -

Grouping and Labeling

In groups of three or four, students will be challenged to select twenty words or phrases from the master list that that is posted on the board. Once students have made their selections, they will be asked to create smaller groups based on similarities. The teacher will say, "We are now going to explore grouping. Your goal is to find similarities between your selected words and our concept, ethics. Sound easy enough, right? There's one slight catch, each group must adhere to the following constraints:

Discovering Ethics



- Students will not be permitted to include the words artificial intelligence on their list.
- Students must have a minimum of four categories
- Student must have a minimum of three words under each category
- Words/phrase may only be used once

Teacher will monitor throughout the room as students work in groups. As students complete their compilations, the teacher will instruct students to label the categories so that each section illustrates how the words/phrases relate to the concept, ethics. Students will be asked to describe the similarities and differences between categories. Students will also be asked to justify their category labels and their reasons for grouping with the class.

Elaborate —

Subsuming, Regrouping, and Renaming

Student groups will re-categorize items.

Expectations:

- Students must have a minimum of three different categories; students may only keep one category from the last grouping.
- Students must have a minimum of three words under each category.
- Words or phrases may be used in more than one category.
- Categories must relate to the concept, ethics.

Students will briefly share their categories via gallery walk. As students are walking, the teacher will prompt students to pay close attention to the labels that other groups used to define each category. The teacher will follow up by asking all groups to share their categories with the whole class.

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

As a team students will create generalization statements that illustrate how ethics governs discovery. Once groups have created their generalization statements, student will work independently to write a self-reflection.

- Using evidence from the text, students must defend their generalization statements.
- Students must describe and self-evaluate the process they used to form their categories.



Unit Resources

Work Cited

Bob Algozzine & Kelly M. Anderson (2007) Tips for Teaching: Differentiating Instruction to Include All Students, Preventing School Failure: Alternative Education for Children and Youth, 51:3, 49-54, DOI: [10.3200/PSFL.51.3.49-54](https://doi.org/10.3200/PSFL.51.3.49-54)

Baker, A. (2013, January 12). Gifted, Talented and Separated. Retrieved from <https://www.nytimes.com/2013/01/13/education/in-one-school-students-are-divided-by-gifted-label-and-race.html>

Kakoullis, P. (2019, May 01). Transforming The Balance Sheet: Navigating New Lease Standards For Success. Retrieved from <https://www.forbes.com/sites/deloitte/2019/05/01/transforming-the-balance-sheet-navigating-new-lease-standards-for-success/#771130946dad>

Lesson One:

Name _____ Date _____

1. What is biotechnology?

2. Complete the chart below.

Branch of Biotechnology	Pros	Cons	Impact on NC
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• • •

Medicine	1.	1.	
	2.	2.	
Agriculture	1.	1.	
	2.	2.	
Sustainability	1.	1.	
	2.	2.	

Name KEY Date _____

1. What is biotechnology?
Any technology based on a biological system or organism. Often using organisms to solve real world human problems. For example, genetically modifying crops in hopes of producing more food to solve the problem of a growing world population. Biotechnology can be used to alter genes, clean up waste, create new fuel sources, and genetically engineer better foods.

2. Complete the chart below. (The answer below will vary. This is a sample.)

Discovering Ethics



Branch of Biotechnology	Pros	Cons	Impact on NC
Medicine	<u>1. Can be used to screen for possible diseases.</u> <u>2. Creation of medicines and drugs that are used to cure or treat a variety of diseases that were once deadly.</u>	<u>1. Ethical issues in regards to many areas such as cloning.</u> <u>2. Unknown long term effects.</u>	<u>RTP is one of the largest research parks in the United States. This attracts many companies to the area which increases jobs and economy in NC.</u>
Agriculture	<u>1. Can help to reduce the use of chemical pesticides by creating insect resistant crops.</u> <u>2. Larger crop yields and larger foods will help with the growing population and hunger issues around the world.</u>	<u>1. Decrease in biodiversity of plants.</u> <u>2. Unknown long term effects.</u>	<u>Some of the world's largest agricultural companies are located in NC. This also increase job opportunities and increases the financial gains of the state by increasing crop yields.</u>
Sustainability	<u>1. Reduce the use of fossil fuels.</u> <u>2. Help to create renewable energy sources that will reduce climate change and pollution.</u>	<u>1. Expensive</u> <u>2. Lack of space/resources that can be used as alternative fuel sources.</u>	<u>Over the past decade clean energy initiatives in NC have helped to reduce electric bills, increase jobs, and provide us with clean, safe power sources.</u>

Variables affecting cell growth

Discovering Ethics



TASK 1: Brainstorm

Write down all the things that cells need to grow and be happy.

TASK 2: Bubbles and Cell Growth

Materials for each table

Transfer pipette (2)

Dish washing soap

Hyclone

50 ml tube with cap filled with 25ml of water (3 per pair)

Instructions

1. In tube #1 and #2 squirt 1 dropper full of dish washing soap using the transfer pipette.
2. Place the lid on the tubes and shake for 10 seconds.

What do you observe in tube #1 and tube #2?

3. In tube #1 squirt **2** droppers full of Hyclone. Place the lid on the tube and shake for 10 seconds.

What did you observe in tube #1 when you added the Hyclone?

What did you observe in tube #1 after shaking?

4. In tube #3 add 2 droppers full of Hyclone. Place the lid on the tube and shake for 10 seconds.

Discovering Ethics



5. In tube #3 add 1 dropper full of dish washing soap. Place the lid on the tube and shake for 10 seconds.

What do you observe in tube #3 when you added Hyclone first?

What do you think this has to do with growing cells?

TASK 3: Hypothesize which temperature is best for yeast cells.

Record your hypothesis here: _____

TASK 4: Visually observe the yeast samples at each temperature.

Temperature	Observations: Color, Clear or Cloudy, Rank the tubes – clear (1) to cloudy (5)
10° Celsius	
20° Celsius	
30° Celsius	
40° Celsius	
Control (no cells added only media)	

****Which cell culture is the cloudiest? What do you think this means?**



TASK 5: Percent cell volume – centrifuge cell pellet.

Place the lid on your tube and gently rock your cell culture. Pipette 1,000 µl of cells into a microcentrifuge tube. Centrifuge for 1 minute. Observe the pellet and record your data below.

Temperature	Record the number of µl the cells occupy at the bottom of the tube
10° Celsius	µl
20° Celsius	µl
30° Celsius	µl
40° Celsius	µl

****Which cell culture had the most cells?**

LAB QUESTIONS

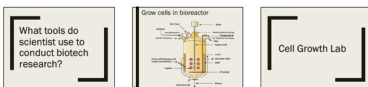
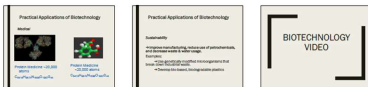
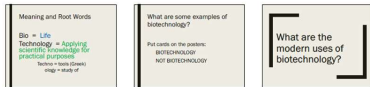
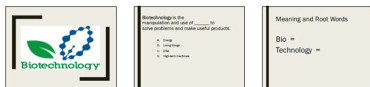
Based on your data and observations which temperature provided the healthiest cell conditions? Explain using evidence from the data tables.

Discovering Ethics



Would growth conditions have to be different depending on the types of cells? (Yeast vs bacteria vs plant vs animal cells)

How do you think cell health relates to the health of your body systems? (think about relationships between cells, tissues, organs and systems)



(This is the power-point used to introduce biotechnology via Bruner model)

Lesson Two:

Discovering Ethics



<https://www.youtube.com/watch?v=evH0I7Coc54>

<https://www.nationalgeographic.com/science/health-and-human-body/human-body/stem-cell-divide> (The is TBL article.)

Concept Map Rubric	1	2	3
Position: stated and included it in the appropriate place in the paper, was thoroughly supported throughout the paper.			
Reasoning: well developed and thought out reasons. Reasons show strong analysis and conclusions based on the information.			
Depth: Position is supported in depth with a variety of sources. Substantial valid and accurate information in the form of expert opinion, statistics, research studies, etc. has been used			

Lesson Three:

Socratic Reflective Writing

1. What is one thing you liked that you said?
2. What is one point someone else said that you agree with?
3. What was the most interesting question?
4. What was the most interesting idea to come from a participant?
5. What was the best thing that you observed?
6. What was the most troubling thing that you observed?
7. What do you think should be done differently in the next seminar?
8. As a Socratic Seminar participant, what area of the process will you work on for next time?
9. What new questions arose as a result of the discussion and debrief?

(Students used this tool to self evaluate their performance after the seminar)

Discovering Ethics



Name: _____

Directions: Choose three participants in the seminar to observe. Write examples of the behaviors listed below as you see or hear them occur.

Participant Name	Offers New Idea	Asks a Question	Refers to Text	Builds on Other's Idea	Distracting Behavior	Other Notes/Observations
1.						
2.						
3.						

(Students used this tool to evaluate the performance of their peers after the seminar)

<https://www.nationalgeographic.com/magazine/2017/04/evolution-genetics-medicine-brain-technology-cyborg/>

Lesson Four:

PSA Components	5	4	3	2	1
Technical Aspects Video reflects effective camera work, editing skills, use of lighting and sound that add to the overall mood/message/theme of the piece.					
Creativity The message is told in unexpected or novel ways. Elements in the message are woven together with insight and imagination grabbing the attention of the intended audience.					
Tag Line The message is clear and concise. A single thought or phrase within the PSA summarizes the entire message.					
Social Benefit The ideas shown have an application to the lives of the targeted audience. The PSA is one that will motivate change to improve the targeted audience's community in a meaningful way.					

Discovering Ethics



Facts The message is based on accurate and verifiable information. Opinion or bias expressed is based in and supported by fact. Source information has been verified and documented.					
Follow-up Follow-up information is provided to direct the intended audience to local or national advocacy groups.					
Collaboration Almost always listens to, shares with, and supports the efforts of others in the group. Tries to keep people working together.					
Written Work All deadlines are met. Storyboard, shot list, and script have been approved before shooting and are turned in at the final screening.					

Total

Points _____

Scoring Guide:

5 = The highest score possible; indicates a highly effective use of a component. Exemplary demonstration of effort and achievement throughout the video.

4 = Accomplished use of component(s) is consistently demonstrated throughout the video.

3 = Elements described may be present, but are inconsistently or haphazardly applied.

2 = Effort is demonstrated towards incorporating the component(s) listed and described, but the desired results are not seen in the final product.

1 = Scores of 1 reflect the absence of the described elements.

(This is rubric used to evaluate peers.)