

Biotechnological Issues and Bioethics

Strand Life at the Molecular and Cellular Level

Topic Investigating biotechnology as applied to genetics

Primary SOL BIO.5 The student will investigate and understand common mechanisms of inheritance and protein synthesis. Key concepts include

- i) use, limitations, and misuse of genetic information; and
- j) exploration of the impact of DNA technologies.

Materials

- Copies of the four attached handouts
- 300 participation vouchers (small, ticket-like slips)

Vocabulary

bioethics, biotechnology, cloning, DNA, DNA fingerprinting, egg, embryo, gamete, gel electrophoresis, gene, gene therapy, genetic engineering, Human Genome Project, hybrid, plasmid, recombinant DNA, restriction enzyme, transgenic organism, zygote

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

This lesson is a great conclusion to a genetics unit, as it ties together concepts of modern genetics and current issues in biotechnology. Role-playing will promote creativity and enable students to make connections to the real world. Students will role-play and discuss the ethics involved in the purposes and uses of biotechnology in the modern world. A Socratic seminar will promote team building and classroom community and will encourage appropriate communication about a controversial topic. During the seminar, students will present their personal views and understandings of biotechnological issues involving ethics but will also defend opposing views, using current, factual information. Discussion and defense of opposing views will promote a better understanding of the topic and its key vocabulary.

This is a post-learning activity that depends on prior knowledge of the purposes, uses, and kinds of biotechnology.

1. As a warm-up, have students write down all the DNA technologies or biotechnologies they can think of. Then, have them share their thoughts. Compile a class list of these technologies.
2. Hold a brief discussion of ethics and morality—what they are and how they should be applied in the field of biotechnology—using brainstorming as a strategy to facilitate discussion.
3. Distribute copies of the attached Unsent Letters handout, the two letter templates, and the Scoring Guides for Unsent Letters. Discuss the expectations for the activity as defined in the activity sheet and the two scoring guides.
4. Have students work independently to complete their letters.
5. When students have finished writing, have them share their letters with the rest of the class by holding a Socratic seminar. Distribute copies of the Socratic Seminar in Bioethics

- handout, and review and explain it. Make sure students understand the expectations. Have them either read their own letters aloud or exchange letters with partners to read silently.
6. To start the Socratic seminar, either ask a bioethics question to prompt student discussion, or allow a student to ask such a question. (During the seminar, your role is to facilitate discussion by making sure all participants maintain respectful, professional, and courteous behavior and by keeping the conversation focused and flowing. You may have to elucidate questions that cannot be answered by the student discussion. Introduce the concept of agreeing to disagree, as needed!) Take note of each student's participation during the seminar, handing a participation voucher to a student every time he/she participates effectively and appropriately. Encourage students to participate at least three times. For a class of 30, you might make each voucher worth 30 points. Of course, awarding of points is solely at the discretion of the teacher.

Assessment

- **Journal/Writing Prompts**
 - Write a reflection essay on the activity in which you express your views on bioethics and morality and whether your views changed during the Socratic seminar. Explain why your views changed or did not change.
- **Other**
 - Use the Scoring Guides to assess students' letters.
 - Tally the total number of participation points each student earned in the Socratic seminar.

Extensions and Connections (for all students)

- Have students write a reflection essay on the question, "How might transgenic organisms affect or change the evolution of that organism?" Have them discuss their personal opinions of this question, explaining why they think their opinions are true.

Strategies for Differentiation

- Employ flexible groupings of students by grouping them according to common readiness levels, shared interests, or diverse strengths.
- Appoint leaders of the discussion, or have them volunteer.

Unsent Letters

Directions

In this activity, you will play the roles of two people: the owner of a company and a newly hired employee of that company.

Read the two descriptions below. Then, using the letter-form handouts, write a letter as each person, following the directions given below. Be sure to include all the specified information, and use your imagination.

1. Letter to your new employee

You are Ms. Danielle Wish, president of Globex, Inc., a Fortune-500 company. Your Human Resources Director has just completed the hiring process for the spring. Write a letter to a new hire, Mr. Michael Dinson, informing him that you need to have access to all of his medical records and that he must have a DNA fingerprint done to keep on file. Explain to Mr. Dinson the reasons why the company must have this information. Be sure to make it clear what kind of company Globex is and what position Mr. Dinson will have at the company.

2. Response letter to your new boss

You are Mr. Dinson, a newly hired employee at Globex, Inc. Before your first day at work, you receive the above letter from the president of the company. Write a response letter to Ms. Wish, saying whether you agree to the company having access to your medical records and whether you agree to a genetic screening before you go to work for them. Explain your reasoning as it applies to both the company and your job description, and be sure to let Ms. Wish know whether you will be coming to work for the company or not.



GLOBEX, INC.

**Danielle Wish, President
Globex, Inc.
777 World Ave.
Big City, US 10001**

Mr. Michael Dinson
332 Newman Rd.
Small City, US 10002

Dear Mr. Dinson:

Michael Dinson

332 Newman Rd.
Small City, US 10002

Ms. Danielle Wish, President
Globex, Inc.
777 World Ave.
Big City, US 10001

Dear Ms. Wish:

Scoring Guides for Unsent Letters

1. Letter from Ms. Wish

Section	3 – Excellent	2 – Acceptable	1 – Unacceptable
Letter format	<ul style="list-style-type: none"> Written in proper letter format Most language is realistic and appropriate for a business letter. Addresses Mr. Dinson specifically Includes portions of letter not given on paper 	<ul style="list-style-type: none"> Written in a letter format Some language is unrealistic or inappropriate. Addresses Mr. Dinson occasionally Includes portions of letter not given on paper 	<ul style="list-style-type: none"> Not written in a letter format Most language is unrealistic or inappropriate. Seldom addresses Mr. Dinson Does not include portions of letter not given on paper
Required information	<ul style="list-style-type: none"> Includes specific information about the company and Mr. Dinson’s job description Information about DNA fingerprinting is complete and correct. 	<ul style="list-style-type: none"> Includes vague information about the company and Mr. Dinson’s job Information about DNA fingerprinting is incomplete or incorrect. 	<ul style="list-style-type: none"> Little or no information about the company and Mr. Dinson’s job description No information about DNA fingerprinting
Reasoning	<ul style="list-style-type: none"> Includes critical and complete reasoning behind the need for such information Demonstrates thoughtfulness and ability to incorporate the content into the letter 	<ul style="list-style-type: none"> Includes some reasons for requiring the information, but no demonstration of critical thought Not much incorporation of content into the letter 	<ul style="list-style-type: none"> Includes very few to no reasons for requiring the information No incorporation of content into the letter

2. Response Letter from Mr. Dinson

Section	3 – Excellent	2 – Acceptable	1 – Unacceptable
Letter format	<ul style="list-style-type: none"> Written in proper letter format Most language is realistic and appropriate for a business letter. Addresses Ms. Wish specifically Includes portions of letter not given on paper 	<ul style="list-style-type: none"> Written in a letter format Some language is unrealistic or inappropriate. Addresses Ms. Wish Includes portions of letter not given on paper 	<ul style="list-style-type: none"> Not written in a letter format Most language is unrealistic or inappropriate. Seldom addresses Ms. Wish Does not include portions of letter not given on paper
Response to demand	<ul style="list-style-type: none"> Clearly states whether Mr. Dinson agrees to allowing access to his medical records and giving permission to get a DNA fingerprint 	<ul style="list-style-type: none"> Vaguely states Mr. Dinson’s stance on allowing access to his medical records and giving permission to get a DNA fingerprint 	<ul style="list-style-type: none"> Does not state Mr. Dinson’s stance on allowing Globex to have the requested information
Reasoning and support	<ul style="list-style-type: none"> Includes clear reasoning for accepting or denying access to medical/DNA information Includes specific reasons Demonstrates critical and evaluative thinking Writing is clear. 	<ul style="list-style-type: none"> Includes vague reasoning for accepting or denying access to medical/DNA information Includes few specific reasons Demonstrates little critical and evaluative thinking Writing is moderately clear. 	<ul style="list-style-type: none"> Includes no obvious reasons for accepting or denying access to medical/DNA information Demonstrates no real critical or evaluative thinking Writing is vague and unclear.
Acceptance of job	<ul style="list-style-type: none"> Clear statement of acceptance or rejection of job offer Decision reflects reasoning throughout rest of letter. 	<ul style="list-style-type: none"> Clear statement of acceptance or rejection of job offer Decision contradicts some of the previous reasoning. 	<ul style="list-style-type: none"> No evident statement of acceptance or rejection of job offer

Socratic Seminar in Bioethics

What Is It?

A Socratic seminar is a way that a concept or topic can be taught and learned through the discussions of a large group. The teacher or a student asks a question that prompts the discussion.

What Is a Socratic Seminar in Bioethics?

The question is formulated by the thoughts and opinions of the students in the class, based on their views of bioethics and the letters they wrote in class. All students are encouraged to speak their ideas and opinions freely, but in turn, about the topic of bioethics.

Directions

- Read some of the “Unsent Letters” of your classmates. You may also want to review any notes or other related materials that will help you reinforce the discussion.
- When a question is asked, anyone is free to answer it. Only *one person may speak at a time*, but everyone should get a chance to participate.
- As you participate, you will receive participation vouchers given out by the teacher. Each voucher is worth a teacher-specified number of points, so the more you get, the better your grade.
- Every time you do *not* follow the expectations listed below, you will lose a voucher.
- You will tally your voucher points at the end of the activity.

Expectations

- Start your sentence by saying, “I agree...” or “I disagree...”.
- Be very respectful of others when speaking. Do NOT use personal attacks, a loud voice, or inappropriate language.
- Be sure only one person speaks at a time. Take turns. Do not monopolize the discussion.
- When speaking, speak to everyone.
- Look at your notes, letters, or any information at any time, as you wish.
- Ask for clarification if at any time you do not understand something that is said.