Teacher Guide: The Bioethics of Human Cloning

ACTIVITY OVERVIEW

Abstract:
Students form groups of stakeholders to examine, discuss and make recommendations for scenarios involving human cloning. Once group work is complete, students are asked to consider the scenario individually using a bioethical decision-making model that emphasizes solutions, personal values and consequences.

Module:
Cloning in Focus

Prior Knowledge Needed:
None

Key Concepts:
Applications of human cloning; ethical, personal and social implications of human cloning.

Materials:
Student Pages

Appropriate For:
Ages: 12 - 20
USA grades: 7 - 12

Prep Time:
15 minutes

Class Time:
45-90 mins depending on length of discussion

Activity Overview Web Address:
http://gslc.genetics.utah.edu/teachers/tindex/overview.cfm?id=cloningethics

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I. PEDAGOGY

A. Learning Objectives

- Students will analyze the social, ethical, legal, psychological and philosophical problems that may arise as a result of human cloning.
- Students will examine and discuss a bioethical issue from the perspective of an involved stakeholder.
- Students will apply personal values and beliefs to a bioethical dilemma.

B. Background Information

As cloning technologies improve and an increasing number of attempts to clone organisms are met with success, the possibility of human cloning is becoming an issue. Proponents of human cloning cite benefits in stem cell therapies and infertility treatments while opponents cite moral, religious and ethical objections. Should human cloning under any circumstances be allowed?

In this activity, students play the roles of different stakeholders while considering a scenario involving human cloning. Each group is asked to make a recommendation about whether human cloning should be allowed in this case. After students have shared their ideas and reached a consensus within their groups, they then consider the scenario individually and express their personal point of view using a bioethical decision making framework for guidance. Group work in roles will hopefully inform personal reflection.

This activity can be done in three ways depending on the level of the class and their experience with discussion groups, debate or bioethical decision making.

In the “beginner” version (Option 1) students meet in same-role stakeholder groups to discuss the issue. (The doctors form one group, the lawyers form another, etc…). It is often easier for students to generate ideas about points of view appropriate to their role and discuss the issue in this manner.

In the “intermediate” version (Option 2) students first meet in same-role stakeholder groups to generate ideas in their particular role. They then re-organize to form groups of mixed stakeholders (i.e., one Doctor, one Lawyer, one Community member) with each role represented in each group. This helps students formulate ideas about how their role, or character would respond before being asked to do so in a mixed-group setting. This method also exposes students to the points of view of other stakeholders.

In the "advanced" version (Option 3) students meet in mixed stakeholder groups from the beginning. This approach is best used with students who are familiar with thinking from perspectives that are not their own and who will have little trouble generating ideas from their role/perspective to share with their group.

C. Teaching Strategies

1. Timeline

- Day before activity:
  - Choose which scenario to use
  - Make copies of the scenario and student pages

- Day of activity:
  - Assign a scenario
  - Brainstorm issues and values related to the scenario
  - Divide class into stakeholder groups
  - Provide time for groups to discuss the situation and come up with a recommendation
  - Have groups report their recommendation
  - Give each student the Values and Descriptors and Bioethical Decision Making Model for individual consideration of the scenario

2. Classroom Implementation

Choose one of the three scenarios provided (pages S-5, S-6 and S-7) to use with one of the following options.

Option 1

1. Begin class by asking those who are in favor of human cloning to raise their hands. Do the same for those who are opposed.

2. As a class, brainstorm a list of issues or values that would influence an answer to the previous question. (for example, economic, religious, etc.)

3. Divide the class into same-role stakeholder groups as outlined on the bottom of your chosen scenario (i.e., one group of "doctors", one group of "lawyers", one group of "citizens", etc.). Distribute copies of the scenario for the groups to read. Remind students that they will need to remain in character throughout the group discussions.

4. Instruct each group to discuss (from the perspective of their stakeholder role) whether or not human cloning should be allowed under the

circumstances described in the scenario. Each member should share their perspective and recommendation first. Then the group must reach consensus on a final recommendation and list the rationale behind their recommendation.

Teaching Tip: You may want to have each group discuss the characteristics of their stakeholder role if they are having a hard time getting into character.

5. Have each group present their recommendation and rationale to the class.

Teaching Tip: You may also want to ask groups to share information about their group process. How did they reach consensus? Is this a unanimous recommendation? Was there strong agreement or opposition within the group?

6. After the presentations, give each student a copy of the Values and Descriptors (pages S-1 and S-2) and instruct them to cross off any of the values that they do not personally hold. They may also add values to the list or modify the definitions of the values as they see fit. At this point, students are no longer acting in their stakeholder role, but are examining their own personal beliefs and ideas.

7. Give each student a copy of the Bioethical Decision Making Model worksheet (pages S-3 and S-4) and instruct them to apply the model to the scenario they have been working with.

Teaching Note: The Values and Descriptors and Bioethical Decision Making Model can be assigned as homework if you are short on time.

Option 2

1. Begin class by asking those who are in favor of human cloning to raise their hands. Do the same for those who are opposed.

2. As a class, brainstorm a list of issues or values that would influence an answer to the previous question. (for example, economic, religious, etc.)

3. Divide the class into same-role stakeholder groups as outlined at the bottom of your chosen scenario (i.e., one group of “doctors”, one group of “lawyers”, one group of “citizens” etc.). Distribute copies of the scenario for

the groups to read. Remind students that they will need to remain in character throughout the group discussions. Ask each group to discuss the point of view and values their stakeholder role might hold in relation to the scenario.

4. Next, recombine the students to form mixed-stakeholder groups. Each new group should have at least one representative of each stakeholder role. (i.e., a new group containing one "doctor", one "lawyer" and one "citizen").

5. Carry out steps 4-7 as listed in *Option 1*

Option 3

1. Begin class by asking those who are in favor of human cloning to raise their hands. Do the same for those who are opposed.

2. As a class, brainstorm a list of issues or values that would influence an answer to the previous question (for example, economic, religious, etc.)

3. Divide the class into mixed stakeholder groups as outlined at the bottom of your chosen scenario. Distribute copies of the scenario for the groups to read. There should be at least one of each stakeholder type listed in each group.

4. Carry out steps 4-7 as listed in *Option 1*

3. Extensions

- Have students research issues in human cloning during or after completing this exercise. Specifically, ask your students to research whether or not the scenario you are using is possible or if anyone has made a similar appeal in reality.

- Apply the Bioethical Decision Making Model (pages S-3 and S-4) to other topic areas throughout the year. If used repeatedly, students will become accustomed to making bioethical decisions in all areas of science.

- Have students write their own scenarios, addressing issues related to human cloning.

4. Adaptations

- Discuss these scenarios as a whole class rather than in stakeholder groups. To do so:

- Hand out a copy of the Values and Descriptors (pages S-1 and S-2) and instruct students to cross off any of the values that they do not personally hold. They may also add values to the list or modify the definitions of the values as they see fit.
- Choose one of the three scenarios provided (pages S-5, S-6 and S-7) Read through it as a class and discuss.
- Identify the values that are at odds with one another.
- Hand out the Bioethical Decision Making Model (pages S-3 and S-4). Complete it as a class using the scenario you have just read and discussed.
- Assign students a different scenario (pages S-5, S-6 and S-7) and instruct them to complete the Bioethical Decision Making Model individually, using the new scenario.

• Rather than using only one of the scenarios provided, you may wish to use all three, assigning a different scenario to each group.

• Assign a different scenario than the one discussed in class for students to use with the Bioethical Decision Making Model worksheet.

3. Assessment Suggestions

• Use the group presentations as an assessment.
• Use the Bioethical Decision Making Model worksheet as an assessment.

II. ADDITIONAL RESOURCES

A. Activity Resources - linked from the online Activity Overview:
http://gslc.genetics.utah.edu/teachers/tindex/overview.cfm?id=cloningethics

- Website: “What are Some Issues in Cloning?” - an overview of bioethical issues related to cloning
- Website: “Additional Resources” in the *Cloning in Focus* module - more detailed information on bioethical issues related to cloning
- Website: *Stem Cells in the Spotlight* module - information on stem cells
- Website: “Help me! Clone my Kidneys” - the personal story of a woman hoping to receive a cloned kidney

III. MATERIALS

A. Detailed Materials List

• Copies of chosen scenario (S-5, S-6 or S-7) - one per group or one per student
• Student pages S-1 to S-4 - one copy for each student

IV. STANDARDS

A. U.S. National Science Education Standards

Grades 5-8:

- Content Standard F: Science in Personal and Social Perspectives - Science and Technology in Society; technology influences society through its products and processes; social needs, attitudes and values influence the direction of technological development.

Grades 9-12:

- Content Standard E: Science and Technology - Understandings About Science and Technology; technological solutions may create new problems; sometimes scientific advances challenge people's beliefs and practical explanations concerning various aspects of the world.
- Content Standard F: Science in Personal and Social Perspectives - Science and Technology in Local, National and Global Challenges; science and technology are essential social enterprises, but alone they can only indicate what can happen, not what should happen. The latter involves human decisions about human knowledge.
- Content Standard F: Science in Personal and Social Perspectives - Science and Technology in Local, National and Global Challenges; individuals and society must decide on proposals involving new research and the introduction of new technologies into society.

B. AAAS Benchmarks for Science Literacy

Grades 6-8:

- The Nature of Technology: Issues in Technology - societies influence what aspects of technology are developed and how these are used; people control technology (as well as science) and are responsible for its effects.

Grades 9-12:

- The Nature of Technology: Issues in Technology - social and economic forces strongly influence which technologies will be developed and used; which will prevail is affected by many factors, such as personal values, consumer acceptance, patent laws, the availability of risk capital, the federal budget, local and national regulations, media attention, economic competition, and tax incentives.
- The Designed World: Health Technology - knowledge of genetics is opening whole new fields of health care.
- The Designed World: Health Technology - biotechnology has contributed to health improvement in many ways, but its cost and application have led to a variety of controversial social and ethical issues.

C. Utah Science Core Curriculum

Intended Learning Outcomes for Seventh and Eighth Grade Science
Students will be able to:

5. Demonstrate Awareness of Social and Historical Aspects of Science
   a. Cite examples of how science affects life.

Intended Learning Outcomes for Ninth to Twelfth Grade Science
Students will be able to:

2. Manifest Scientific Attitudes and Interests
   d. Accept responsibility for actively helping to resolve social, ethical and ecological problems related to science and technology.

Biology (9-12):
Standard IV: Students will understand that genetic information coded in DNA is passed from parents to offspring by sexual and asexual reproduction. The basic structure of DNA is the same in all living things. Changes in DNA may alter genetic expression.
Objective 1: Explain how the structure and replication of DNA are essential to heredity and protein synthesis.
f. Research, report, and debate genetic technologies that may improve the quality of life (e.g., genetic engineering, cloning, gene splicing).

V. CREDITS

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The Values and Descriptors are taken from the Mertens/Hendrix model, Ball State University, © 1982.
The Bioethical Decision-Making Model is adapted from the Dr. Jon R. Hendrix model, Ball State University, © 1980.

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Values and Descriptors

Read through each of the following values and its definition. Cross out values that are not meaningful for you and add others that do have meaning for you. Be sure to define any values that you add.

ACHIEVEMENT: Accomplishment; a result brought about by hard work to attain a desired goal.

AESTHETICS: The appreciation and enjoyment of beauty for beauty's sake.

ALTRUISM: Concern for the interests of others.

AUTONOMY: Self-directed, capable of existing alone; acting without aid of others.

BEING LIKED: Being held in favor or regard by others.

COOPERATION: Working together for a mutual benefit.

CREATIVITY: Initiating new and innovative ideas and designs.

EDUCATION: The process of gaining knowledge and skills while developing reason, judgment and intellectual maturity.

EMPATHY: The ability to share in someone else's feelings.

EMOTIONAL WELL-BEING: Freedom from overwhelming anxieties and barriers; a peace of mind; inner security.

EQUALITY/RIGHTS: Correspondence in quality, degree, value, rank or ability.

FAMILY/BELONGING: Related by blood or marriage.

FRIENDSHIP: The state of one person being attached to another by feelings of affection or personal regard.

HEALTH: The soundness of one's body.

HONESTY: Fairness or straightforwardness of conduct; integrity; uprightness of character or action.

HUMAN DIGNITY: Holding all humans in high esteem regardless of age, race, or creed.

INTERDEPENDENCE: The mutual need for support, aid, comfort, etc.

INTIMACY: A close, familiar, and usually affectionate or loving personal relationship.

JUSTICE: The quality of being impartial; to treat others fairly or adequately.

KNOWLEDGE: The seeking of truth, information, or principles for the satisfaction of curiosity, for use, or for the power of knowing.

LOVE: Affection based on admiration or benevolence; unselfish devotion.

LOYALTY: Maintaining allegiance to a person, group, institution, or political entity.

MORALITY: The moral values held by an individual or society.

OWNERSHIP: To have or hold material objects or to acknowledge specific ideas as being part of your ideology.

PERSONAL HEALTH: The condition of being sound in body; freedom from physical disease or pain; the general condition of the body; well-being.

PHYSICAL APPEARANCE: Concern for the beauty of one's own body.

PLEASURE: The agreeable emotion accompanying the possession or expectation of what is good or greatly desired; a state of gratification.

PRESTIGE: Holding a position of high value relative to society's standards.

POWER: Possession of control, authority, or influence over others.

RECOGNITION: Being made to feel significant and important; given special notice or attention.

RELIGIOUS BELIEFS: One's convictions or opinions about religion, faith, devotion, etc.

SELF-CONTROL: Restraint of oneself or one's actions, feelings, etc.

SELF-PRESERVATION: Looking out for your own welfare.

SELF-WORTH: A feeling of being useful and/or held in high esteem by others.

SKILL: The ability to use one's knowledge effectively and readily in execution or performance; technical expertise.

SOLITUDE: The state of being removed from society; a quiet life.

TRUTH: An ideal abstraction conforming to a universal or generalized reality.

WEALTH: Abundance or valuable material possession or resources; affluence.

WISDOM: The ability to discern inner qualities and relationships; insights, good sense, judgment.

WORK/LABOR: Exertion or effort directed to produce or accomplish something; toil, effort.

Name _____ Date _____

Bioethical Decision-Making Model

I. State the bioethical problem specific to the scenario (for example, Should human cloning for economic gain be allowed?)

_____

_____

_____

II. List at least 5 possible alternative actions or solutions to the problem, even if you do not agree with some. (Five is the minimum.)

Ranking	**Solution**
_____	1. _____
_____	2. _____
_____	3. _____
_____	4. _____
_____	5. _____
_____	6. _____
_____	7. _____
_____	8. _____

III. Rank these alternatives in order of preference by placing numbers beside your solutions. Rank the solutions from 1 being the one that your values agree with most and 8 your values agree with least. For example place a #1 beside your first choice, #2 beside your second, etc.

IV. Take your #1 solution and list at least 5 values you hold that cause you to rank it #1. Refer to the Values and Descriptors sheet for ideas.

Value	**Personal Meaning of Value Word**
_____	1. _____
_____	2. _____
_____	3. _____
_____	4. _____
_____	5. _____
_____	6. _____
_____	7. _____
_____	8. _____

V. Now take your #1 solution and describe the CONSEQUENCES you think it would have. Consider any 5 of the long term and short term consequences below.

How would this solution:

affect my:	Short Term	Long Term
Money		
Time		
Personal Relationships		
Family		
Friends		
Psychological Self		
Community		
Country		

VI. Place a (+) beside each consequence you hold as "good" and a (-) beside each consequence you hold as "bad".

VII. Are there any "bad" consequences that you could not live with? If so, try another solution or modify your solution.

VIII. List 3 reasons why others might not agree with your solution to the problem.

1. _____
2. _____
3. _____

IX. Restate your solution and then place a confidence or conviction measure on it by marking an X on the confidence scale below. My solution is:

_____

_____

_____

I can live with my solution — very sure

1----------2----------3----------4

I cannot live with my solution — not very sure

A Kidney for Katie

Katie Dyd was an active, playful and energetic little girl. She was always running about, climbing trees, or gathering all of the neighborhood children to play team sports or run races in the yards up and down the street. Katie had a zest for life and actively pursued it.

Mysteriously, Katie began to feel run down, tired and sick overall. After extensive medical tests and many trips to the doctor, it was determined that her kidneys were failing and that she would need a transplant.

Day after day the Dyds watched helplessly as Katie's health faded away and her condition became critical. Although Katie was immediately placed on the transplant list, they were told that it could be years until she received a donated kidney. There were simply too many other people on the list and a very limited supply of donated organs. The Dyds mounted a desperate search to find a medical professional or scientist that could tell them something different or offer an alternative to a donated transplant. Their one ray of hope came in the form of a controversial technique that would involve therapeutic human cloning to create embryonic stem cells for use in growing a replacement organ.

Stem cells are "blank" cells that can differentiate to form any type of cell in the body. In Katie's case, stem cells would be stimulated to differentiate into the cells that create kidney tissue. The differentiated cells would be grown in a carefully controlled and sterile environment until the tissue formed a complete kidney. The kidney would then be transplanted into Katie's body. Researchers have told the Dyds that the success rate for organs grown from embryonic stem cells is higher than with any other type of cell. The transplant is even more successful if the embryonic stem cells used are an exact genetic match to the recipient. To achieve this, the doctors would use one of Katie's somatic cells to produce an embryonic clone from which the stem cells would be harvested.

Because this is such a controversial technique, this form of treatment must first be approved by the Hospital's Ethics Committee before the team of scientists and medical professionals can begin.

Is this a case where human cloning should be allowed? Consider this question from one or more of the following viewpoints.

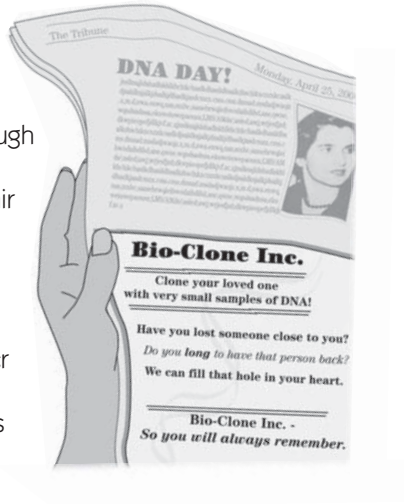
1) A medical professional
2) A scientist
3) A representative from a national organ transplant association
4) The chief administrator of a major hospital
5) A community member
6) A transplant recipient

Name_____ Date_____

The Hope for a Resurrected Child

By many accounts, Ann and Drew Sophila were the happiest married couple in history. When they met there was no question that each had found their partner for life. Their happiness was only compounded by the birth of their son Junior. In Junior, the Sophilas saw a combination of the very best parts of each other. They cherished every moment they had together and reveled in watching Junior grow with each passing day.

Sadly, the Sophilas' happiness ended tragically while on holiday at the ocean. During a picnic on a chartered boat away from the crowds, a terrible boating accident claimed the lives of both Drew and Junior. Ann survived, but was absolutely devastated by the loss of her precious son and loving husband.



Stricken with grief and unable to move on, Ann knew she would never feel "normal" again without a child to raise and love. Ann could not bear the thought of having a child that was not Drew's, however. A local biotech company had been advertising breakthrough advances in cloning technology that enabled them to clone organisms from very small samples of DNA. According to the company, a small sample of bodily fluid, tissue, or hair from an organism yielded enough DNA to successfully produce a clone. This gave Ann a wonderful idea.

She rummaged through the house until she found Junior's hair brush. Trapped in the bristles was enough of Junior's hair to produce a clone. A clone produced in this manner would not only bring a child, but a child with a biological connection to her dear late husband back into Ann's life. Ann contacted the biotech company immediately and was informed about an important process they must go through before they can begin.

In an effort to regulate human cloning, the federal government has set up a new Human Cloning Ethics Committee to oversee all cloning practices. The Human Cloning Ethics Committee consists of a research scientist, a doctor, the president of a biotech company, a psychologist, a member of the clergy, and a member of the community. Biotech companies must receive approval from the Committee before they begin any cloning projects. Ann's request is the first of this type the Committee has considered.

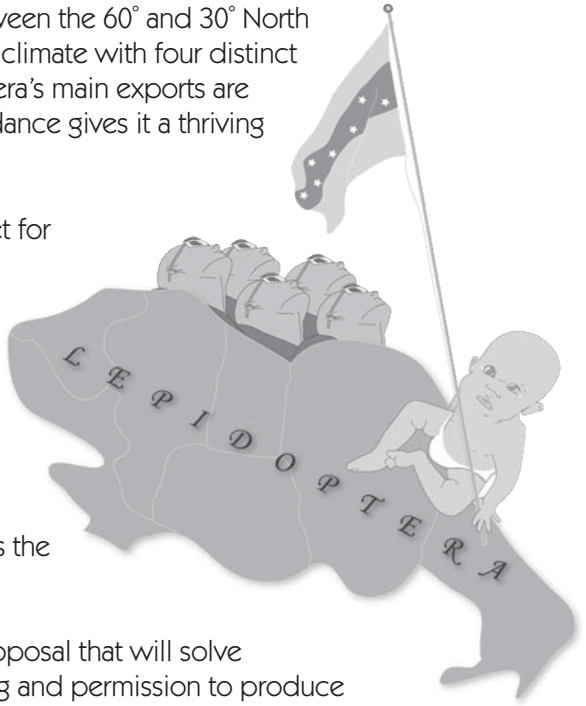
Is this a case where human cloning should be allowed? Consider this question from one or more of the following viewpoints:

1) A research scientist
2) A doctor
3) The president of a biotechnology company
4) A psychologist
5) A member of the clergy
6) A community member

Name _____ Date _____

Protecting the Nation of Lepidoptera

Lepidoptera is a wealthy industrialized nation located between the 60° and 30° North latitudes. It is bordered by two oceans, enjoys a moderate climate with four distinct seasons, and has rich and fertile soil throughout. Lepidoptera's main exports are oil, natural gas, wheat, corn and timber. The nation's abundance gives it a thriving economy and a well cared for and productive populace.



Unfortunately, Lepidoptera's abundance has made it a target for neighboring nations greedy for its land and resources. The country has been attacked a number of times by land, air and sea, but each time has managed to defend its borders. These victories have not come without a cost, however. Lepidoptera has lost many people in the battles and now its overall population is diminished and birth rates are low. Worried about future attacks and the nation's inability to swiftly repopulate, Lepidoptera's leaders and military figures are holding a meeting to discuss the vulnerable future of their nation.

A group of genetic scientists have come forward with a proposal that will solve Lepidoptera's dilemma. The scientists are asking for funding and permission to produce clones of soldiers known for their skill on the battlefield. Not only will this increase the number of military personnel, but it will also produce soldiers with physical characteristics that are superior in battle. The clones will be well cared for by loving military families and trained until it is time for them to serve their country.

Is this a case where human cloning should be funded and allowed? Consider this question from one or more of the following viewpoints.

1) A citizen of Lepidoptera
2) The General in charge of Lepidoptera's military
3) The parents or spouse of a soldier the group is hoping to clone
4) A soldier the group is hoping to clone