

## Activity 5: Taking A Stand on Stem Cell Research

### Teaching Notes

This activity offers two very different methods of engaging students in the political and ethical debates surrounding stem cell research. This type of engagement is important for future scientists who will need to learn how to communicate their results to a larger audience and be aware of the interests outside of the scientific community that influence the direction of scientific research. These conversations are just as important to those who may not go on to careers in science as they may be required to make decisions about stem cell therapies on a personal or social level at some point in their future.

**Assignment 1** asks students to role-play members of various interests groups and participate in a symposium on the future of stem cell research. It could be used with majors or non-majors and is more appropriate for smaller sized classes that can take advantage of face-to-face discussion. Since students have little time to prepare for this symposium, the assignment is designed to pique their interest and encourage them to conduct more research in this area, but a series of review articles and websites will aid the student with no stem cell research background.

**Assignment 2** is more sophisticated in its analysis of positions taken by various interest groups with respect to oversight and funding of stem cell research. For this assignment students are asked to complete an extensive reading list and conduct research to compose a letter to a policy maker that articulates a specific call to action regarding stem cell research policies.

The two assignments can also be combined so that students role-play and conduct their own literature research to frame their response to a particular bill which will be brought to vote. These written statements are shared with the class via a symposium. Students then take what they have learned from the symposium to draft a letter to a policy maker. .

### Assignment 1: Stem Cell Research Symposium

#### Assignment 1 at a Glance

<b>Class</b>	Small size class (20-50) Non-majors to advanced level biology majors
<b>Instructor Preparation</b>	Two to three hours Review <b>Assignment 1</b> and assign students to groups. Review <b>Activity 5, Answers</b> . Also read <b>Stem Cell Research Background</b> .
<b>Useful Media</b>	Please see the <b>References</b> document for useful <a href="#">media</a> to introduce this <b>Assignment</b>
<b>Student time</b>	Outside of Class: six-ten hours, but should be spread out over a weekend In Class: one to two class sessions or the equivalent of ninety minutes

## Activity 5: Taking A Stand on Stem Cell Research

### Background Reading

The following textbook selections are interchangeable:

#### ***Molecular Biology of the Cell*** **Fourth Edition**

Alberts, et al. (2002). Garland Science. New York.

- **Chapter 4:** “DNA and Chromosomes.” p. 191-234
- **Chapter 7:** “Control of Gene Expression.” This chapter is very detailed. These sections are particularly useful:
  - *An Overview of Gene Control.* p. 375-379.
  - *How Genetic Switches Work* p. 398-408.
  - *The Molecular Genetic Mechanisms That Create Specialized Cell Types.* p 415-435.
- **Chapter 8:** “Manipulating proteins, RNA, and DNA.” p. 476-500, 504-525 and 532-546.
- **Chapter 9:** “Visualizing cells.” p. 547-580.
- **Chapter 17:** “The Cell Cycle and Programmed Cell Death.” p. 983-1026.
- **Chapter 20:** “Germ Cells and Fertilization.” p. 112-1156.
- **Chapter 21:** “Development of Multicellular Organisms” Note that this chapter is very long and is divided in sections that review specific organisms. These sections are particularly useful:
  - *Universal Mechanisms of Animal Development.* p.1157-1170.
  - *The Mouse* p. 1223-1227.
- **Chapter 22:** “Histology: The Lives and Deaths of Cells in Tissues.” Note that this chapter is very long. These sections are particularly useful:
  - *Epidermis and Its Renewal by Stem Cells.* p.1259-1267.
  - *Renewal By Multipotent Stem Cells:*

#### ***Essential Cell Biology*** **Second Edition**

Alberts, et al. (2004). Garland Science. New York.

- **Chapter 4:** “Protein Structure and Function.” p. 160-165.
- **Chapter 5:** “DNA and Chromosomes.” p. 169-194.
- **Chapter 8:** “Control of Gene Expression.” p. 267-292.
- **Chapter 10:** “Manipulating Genes and Cells. p. 321-364.
- **Chapter 16:** “Cell Communication.” p. 533-571.
- **Chapter 18:** “Cell-Cycle Control and Cell Death“ p. 611-636.
- **Chapter 19:** “Cell Division” p. 637-657-658.
- **Chapter 20:** “Genetics, Meiosis, and the Molecular Basis of Heredity.” p. 659-696.
- **Chapter 21:** “Tissues and Cancer.” p. 717-726.

#### ***Biology Today*** **Third edition**

Minkoff and Baker (2004). Garland Science. New York.

- **Chapter 1:** “Biology: Science and Ethics.”p. 1-32.
- **Chapter 4:** “Genetic Engineering and Genomics.” p. 95-122.
- **Chapter 9:** “The Population Experience” section *Human Reproductive Biology Helps Us to Understand Fertility and Infertility.* P. 296-317.
- **Chapter 12:** “Stem Cells, Cell Division, and Cancer.” p. 413-432. Note that this very short chapter

## Activity 5: Taking A Stand on Stem Cell Research

*Blood Cell Formation*. p.1283-1296.

- *Stem Cell Engineering* .p. 1308-1311.

touches on transcription, translation, gene expression, and cell signaling, but for a more comprehensive overview please see the following chapters:

- **Chapter 2:** “Genes Chromosomes and DNA” p. 33-62
- **Chapter 3:** “Human Genetics.” P. 63-94.

### Recommended

Rensberger, B. (1998) Chapter 6: “One Cell Becomes Two,” Chapter 7: “Two Cells Become One,” Chapter 8: “Constructing a Person,” Chapter 10: “Heal Thyself,” and Chapter 11: “In Self-Defense,” in *Life Itself: Exploring the Realm of the Living Cell*. Oxford University Press, New York, NY: 117-188, 204-228.

### Implementation

#### Day 0

1. You may want to begin this assignment by showing video clips from other symposia to give students an idea what might occur. The National Academy of Sciences meeting on Stem Cell Research that was aired on C-Span has some excellent exchanges between scientists and bioethicists and serves as a great example. Review the media selections in the **References** section of this module and order videos in advance.

#### Day 1

2. You might choose to administer this activity at the start of a set of lectures on cell division and cell signaling and then administer **Activity 5, Assignment 2** as a capstone exercise for this section of the course. If you decide to use both assignments it is important to alert students of the second assignment when you are assigning this first one.
3. Assign students to interest groups and direct them to **Assignment 1**. There are a few important things to note in assigning groups
  - You may want to assign **Resource 1: Group Roles**, to help students participate equally in the group discussion.
  - You should make it clear to the students that they will work individually outside of class and only work in groups during class meeting times. It is important to state this at the outset to reduce any anxiety about conflicting schedules outside of class time.
  - Students may be very unaware of the ethical and political dimensions of stem cell research and may find this reading very interesting, but it is important that they

## Activity 5: Taking A Stand on Stem Cell Research

- complete the background scientific reading listed in the assignment if they do not already have background in this area.
- It is best to keep the group size between 3-6 students. If the class is a small one, you can have students work in pairs, or if it is larger, you can have duplicate groups. In this latter case you may be surprised to see that duplicate groups arrive at differing consensus statements and this can be illuminating for students.
  - The discussion/symposium on Day 2 assumes six groups and a ninety-minute class session. If your class meeting time is shorter, you may have students organize into a smaller number of groups, or extend the question and answer section for an additional day.
4. Outside of class (preferably over a weekend), have students complete the assigned reading, and have each student write an individual statement that reflects their group's stance on stem cell research as outlined in the assignment. The statement should be 1-2 pages in length.

### Day 2

5. You should arrive at class having prepared a large sheet of paper with group titles, members, and areas for jotting notes about the statement, line of questioning, and ability to respond to questions. Since the symposium moves rather fast, this sheet will help you keep track of the dialogue, as it is important for you to maintain a record of all statements and the dialogue during the question and answer session.
6. Have the groups assemble and discuss their individual statements for 10-15 minutes and arrive at a consensus statement
7. Ask the groups to read their statements to the other groups. Each group has about three minutes and they can choose one or more persons to represent the group. It is best not to take questions or comments from other groups at this time. Encourage students to take notes and jot down questions.
8. Each group then convenes for 10 minutes and decides on two questions they will pose to another group and prepares to answer potential questions from other groups.
9. Each group then has 30 seconds to ask a question of another group and that group answers. This dialogue continues until each group has asked at least one question of another group. It is important to guide this portion of the symposium, as one group may receive a number of questions while others may not. You may choose to ask other groups for their comments, if there is an unequal line of questioning.
10. You can wrap up the symposium by reviewing any inaccuracies, discussing important points that were not mentioned, and highlighting some of the more salient points of the discussion, as well as any unanswered questions students may have. You may also ask each group to indicate which group they felt did the best job in representing their views and have them highlight effective points or strategies. Since the

## Activity 5: Taking A Stand on Stem Cell Research

symposium moves so quickly, having students contribute their own assessment of the symposium is an important reflective educational activity and will be very illuminating to you as well.

### Alternative

- You may choose to have students engage in online discussion within their group or among groups prior to the symposium. Doing this can increase the sophistication of discussion during the symposium.
- For students with advanced scientific knowledge and writing proficiency, **Assignment 2** may be administered. This assignment extends **Assignment 1** by asking students to compose a letter to a policy maker that expresses their personal desires for a call to action on stem cell research.
- After the symposium, you can ask students to revise their statements and submit them with the original statement.
- An alternative might also include a group that serves as the President's Bioethics Council. This group could be made of members of the listed groups in the assignment, which would illustrate how bias can be introduced in an appointed council. Alternatively, the Council could be a separate group of students, who is then responsible for drafting a report based on the symposium. Or, at the completion of the symposium you could ask each student to imagine that they are a member of the Council who is being asked to contribute to a report for the nation.
- Students could be asked to role-play in the symposium but address a specific initiative, such as the state of Illinois surtax on elective surgery to fund stem cell research.

### Assessment

- Grade students' oral presentations, line of questioning, and answers to questions.
- You may ask students to submit their individual statements for review.

## Assignment 2: Letter to a Policy Maker

### Assignment 2 at a Glance

<b>Class</b>	Small size class (20-50) Non-majors to advanced level biology majors
<b>Instructor Preparation</b>	Two to three hours Review <b>Assignment 2</b> Review <b>Activity 5, Answers.</b> Also read <b>Stem Cell Research Background.</b>
<b>Useful</b>	Please see the <b>References</b> document for useful media to introduce this

## Activity 5: Taking A Stand on Stem Cell Research

Media	Assignment
Student time	Outside of Class: two- four weeks depending on the background of the student and the placement in a course

### Implementation

#### Day 0

1. You may want to begin this assignment by showing video clips from other symposia to give students an idea of the debates involved in regulation of stem cell research. The National Academy of Sciences meeting on Stem Cell Research that was aired on C-Span has some excellent exchanges between scientists and bioethicists and serves as a great example. Review the media selections in the **References** section of this module and order videos in advance.
2. Since **Assignment 2** can be viewed as a capstone exercise and requires a synthesis of science and social science, it is best to alert students of this assignment at the start of the module or at the start of a course to provide them with enough time to conduct the necessary research to write a strong letter. It is also helpful for them to review the **Rubric** for this assignment which appears in the **Core Materials** section, so your expectations are made clear. This is especially important in science courses which rarely include this kind of writing assignment. In addition many of the references that are listed in the assignment are letters written by congressmen, professional societies, and individuals. It may be very helpful to review these letters and point out which letters are strong and why, and to point to specific areas where the letters are weak.
3. Since this activity is student driven and individual, all work should take place outside of the classroom. Therefore it is up to you to decide how much time to allocate for this assignment.

### Alternative

- Students could answer the questions in this assignment instead of writing a letter and these questions could be graded, or students could be asked to act as members of the President's Bioethics Council and write a report to the nation.
- Students could submit drafts, conduct peer review, and submit revisions of their letters. If you choose to incorporate these elements be sure to allow enough time for you to have time to comment and return their work in a timely manner and for students to reflect on comments and make changes.
- If students are in need of more guidance for this letter writing assignment, they can be directed to the articles in **Activity 5, Assignment 1**, and **Activity 1, Assignment 1**.

### Assessment

Student learning can be assessed and options follow:

## Activity 5: Taking A Stand on Stem Cell Research

- Student learning can be assessed by reviewing answers to the questions on **Resource Six: Self-assessment of Writing** and **Resource Five: Peer Assessment of Writing**
- All drafts and peer review comments can be graded. Attention should be given to language, clarity, style, organization, originality, rationale, evidence, and creativity. A **Rubric** is provided as a grading guide in the **Core Materials** section. Sample student letters are also available in the **Sample Student Work** section.