

Activity 1: The Public Profile of Stem Cell Research

Teaching Notes

The assignments in this activity are different versions of the same introductory project designed to pique student interest. Teachers are encouraged to choose between the assignments or to combine them as they think might work best for their own classes. This activity can be used in introductory seminars as well as advanced level courses for either biology majors or non-majors. The level of discussion and the complexity of questions will vary depending on academic background and interest. **Assignment 1** is an individual reflection assignment and does not necessarily use class time, though there are options for in-class discussion. **Assignment 2** is designed to help students construct their own understanding of stem cell biology and its ethical and political dimensions via individual readings and class discussion. Both assignments can be delivered to involve small group work. If used in a freshman seminar, *Never Let Me Go*, the novel by Ishiguro could also be assigned, as it depicts the life of a 31 year old clone and allows students to see the moral dimensions of the stem cell debate from a different vantage point. Alternatively if the course is focused on the relationship between science and policy, *The Republican War on Science* by Chris Mooney and published in 2005 reviews stem cell research policy.

Assignment 1: Personal Reflection

Assignment 1 at a Glance

Class	Any size, see modifications as needed. All levels, but discussion will vary with background.
Instructor Preparation	30 minutes to one hour. Read Assignment 1: Personal Reflection Read Stem Cell Research: Cell Plasticity or Political Rigidity?
Useful Media	Please see the References document for a fully annotated list of useful media to introduce this Assignment Biology: C-Span. (2001). "National Academy of Sciences Forum." VHS and DVD. National Academy of Sciences. C-Span. Washington D.C. August 7. Heated exchange among stem cell scientists and fertility specialists. Public Broadcasting Service. (2001). "Life's Greatest Miracle." Online. VHS. Erikson & Nilsson Production in association with WGBH/Boston et al. Part 4 "The First Two Weeks" and Part 5 "The Embryo Takes Shape." Real-time video and animation of embryogenesis. http://www.pbs.org/wgbh/nova/miracle/program.html "Human embryonic stem cells." Sumanas Inc. NIH. This site

Activity 1: The Public Profile of Stem Cell Research

has a narrated animation of the methods used to isolate and culture embryonic stem cells.

http://www.sumanasinc.com/scienceinfocus/sif_stemcells.html

Dolan DNA Learning Center. "How Embryonic Stem Cells Are Made." Cold Spring Harbor Laboratory. This site contains six slides.

<http://www.dnalc.org/stemcells.html>

Dolan DNA Learning Center. "Cloning 101." Cold Spring Harbor Laboratory. This site demonstrates the Roslin and the Honolulu techniques with animations.

<http://www.dnalc.org/stemcells.html>

Genetics Science Learning Center at the Eccles Institute of Human Genetics University of Utah. "What Is a Stem Cell?" Clicking on the word "animation" leads to an interactive unit on the details of the cell differentiation process.

<http://gslc.genetics.utah.edu/units/stemcells/whatisse/>

(2001). "Appendix A, Early development" in *Stem Cells: Scientific Progress and Future Research Directions*. National Institutes of Health. Washington DC. Contains a number of figures and diagrams that depict fertilization, implantation, embryogenesis, and genomic imprinting.

<http://stemcells.nih.gov/info/scireport/appendixa.pdf>

Society:

Dalrymple, M. (2006). "Bush Vetoes Stem Cell Bill As Promised." Online. Video. ABCNews. 2006.

<http://www.abcnews.go.com/Politics/wireStory?id=2212851>

This site has a link to a 15-minute video clip of press conference.

CNN.Com. (2002). "Stem Cell Debate Video Gallery." VHS. 6 January. This site contains a collection of news clips are available as short video downloads from the link Video Gallery that include gender, political, social, and religious perspectives.

<http://www.cnn.com/SPECIALS/2001/stemcell/>

Public Broadcasting Service. (2004). "Stem Cell Research." Online. Online News Hour With Jim Lehrer. Productions.

August 10. An excellent ten-minute **video** clip reviewing the

Activity 1: The Public Profile of Stem Cell Research

	<p>scientific and political dimensions of U.S. stem cell research. http://www.pbs.org/newshour/bb/health/july-dec04/stemcell_8-10.html</p> <p>CBS. (2002). "Holy Grail." VHS. 60 Minutes II. 5 June. This 15-minute video clip depicts a Sickle Cell Anemia pediatric patient, Keone Penn, being treated with umbilical chord stem cells. http://www.cbsnews.com/stories/2001/11/28/60II/main319351.shtml</p> <p>(2002). "Couple Wants to Have a Baby Using Human Cloning: Interview With Erin Runnion on Connie Chung Tonight." Online transcript and video. CNN.com. August 12. This website contains a transcript of the video and excellent links to interactive sites on cloning, and a cloning timeline. http://archives.cnn.com/2002/HEALTH/08/13/cloned.birth.cna/</p> <p>Davinov, K. (2004). "Science at the Cutting Edge." VHS. The Science Channel, Film Oasis, LLC, and Grenada International. March. Stem Cell Clip 15 minutes of a one-hour special.</p>
Student time	Out of class: 20-30 Minutes. In class: None required

Implementation

1. Show a selection of science and societal video clips at the start of class (see Media above for suggestions or for more selection see Videos and Images in **References** in the **Core Materials**). The most recent press coverage of the Bush Veto is a good choice (Dalrymple, 15-minutes).
2. Direct students to "**Stem Cell Research: Cell Plasticity or Political Rigidity?**" by Katayoun Chamany found in the Core Materials section in **Assignment 1**. This summary mentions a variety of current and future applications of stem cell research, but with few details.
3. Have students read the essay and reflect on the questions in **Assignment 1** on their own. Encourage students to form a personal set of questions that, if answered, would provide a deeper understanding of the molecular mechanisms and societal implications of this research.

Alternatives

Activity 1: The Public Profile of Stem Cell Research

1. The class could be subdivided into small groups to arrive at a consensus on answers to the questions. This, in turn, could be shared with the class.
2. Given the broad expanse of time covered in the essay, students could conduct literature research and construct a timeline of stem cell research (note that many web sites will provide timelines). Students could share these with the class via Powerpoint, poster, or transparency.

Assessment

Since this activity is designed to stimulate interest and discussion, there is no formal assessment. However, there are options for assessment.

1. Students could submit one-page summaries of their answers to the questions found in **Assignment 1**. The summaries could be based on individual work, collective responses from the small groups, or both.
2. If students construct a timeline of stem cell research discoveries and applications, these could be graded or reviewed as well. These could be shared with the class via Powerpoint presentations or posters, in which different groups of students would be responsible for covering a particular period of time. A comprehensive **Time Line** is available in the **Core Materials** section.

Activity 1: The Public Profile of Stem Cell Research

Assignment 2: Structured Class Discussion

Assignment 2 at a Glance

Class	Any size, see modifications as needed. All levels but discussion will vary with background
Instructor Preparation	About two hours Read the Stem Cell Research Background , and Assignment 2 . Assign students to small groups and assign one article per group
Useful Media	Please see the References document for a fully annotated list of useful media to introduce this Assignment Biology: C-Span. (2001). "National Academy of Sciences Forum." VHS and DVD. National Academy of Sciences. C-Span. Washington D.C. August 7. Heated exchange among stem cell scientists and fertility specialists. Public Broadcasting Service. (2001). "Life's Greatest Miracle." Online. VHS. Erikson & Nilsson Production in association with WGBH/Boston et al. Part 4 "The First Two Weeks" and Part 5 "The Embryo Takes Shape." Real-time video and animation of embryogenesis. http://www.pbs.org/wgbh/nova/miracle/program.html "Human embryonic stem cells." Sumanas Inc. NIH. This site has a narrated animation of the methods used to isolate and culture embryonic stem cells. http://www.sumanasinc.com/scienceinfocus/sif_stemcells.html Dolan DNA Learning Center. "How Embryonic Stem Cells Are Made." Cold Spring Harbor Laboratory. This site contains six slides. http://www.dnalc.org/stemcells.html Dolan DNA Learning Center. "Cloning 101." Cold Spring Harbor Laboratory. This site demonstrates the Roslin and the Honolulu techniques with animations. http://www.dnalc.org/stemcells.html Genetics Science Learning Center at the Eccles Institute of

Activity 1: The Public Profile of Stem Cell Research

Human Genetics University of Utah. "What Is a Stem Cell?" Clicking on the word "animation" leads to an interactive unit on the details of the cell differentiation process.

<http://gslc.genetics.utah.edu/units/stemcells/whatissc/>

NIH. (2001). "Appendix A, Early development" in *Stem Cells: Scientific Progress and Future Research Directions*. National Institutes of Health. Washington DC. Contains a number of figures and diagrams that depict fertilization, implantation, embryogenesis, and genomic imprinting.

<http://stemcells.nih.gov/info/scireport/appendixa.pdf>

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http://www.pbs.org/newshour/bb/health/july-dec04/stemcell_8-10.html

CBS. (2002). "Holy Grail." VHS. 60 Minutes II. 5 June. This 15-minute video clip depicts a Sickle Cell Anemia pediatric patient, Keone Penn, being treated with umbilical chord stem cells.

<http://www.cbsnews.com/stories/2001/11/28/60II/main319351.shtml>

(2002). "Couple Wants to Have a Baby Using Human Cloning: Interview With Erin Runnion on Connie Chung Tonight." Online transcript and video. CNN.com. August 12.

Activity 1: The Public Profile of Stem Cell Research

	<p>This website contains a transcript of the video and excellent links to interactive sites on cloning, and a cloning timeline. http://archives.cnn.com/2002/HEALTH/08/13/cloned.birth.cna/</p> <p>Davinov, K. (2004). "Science at the Cutting Edge." VHS. The Science Channel, Film Oasis, LLC, and Grenada International. March. Stem Cell Clip 15 minutes of a one-hour special.</p>
Student Time	<p>Out of class: 45 minutes to one hour In class: One 50 minute period or longer.</p>

Implementation

Day 1 - 10 minutes

1. Show a selection of science and societal video clips at the start of class (see Media above for suggestions or for more selection see Videos and Images in **References** in the **Core Materials**) and direct students to **Assignment 2**). The most recent press coverage of the Bush Veto is a good choice (15 minutes).
2. Break the class into small groups, and assign each group a unique news story that provides a key component to synthesizing a more complete understanding of stem cell research and cloning and their applications. Have students complete the readings outside of class and individually answer the questions outlined in the assignment. In choosing the articles to assign please note:
 - There are approximately twenty-five articles listed. These articles were selected because the language was appropriate for undergraduates and because they work together in the structured discussion format described below.
 - In choosing your selections it is best to choose a collection that still demonstrates interdependency during the discussion. For a class of twenty working in pairs, I suggest #3 (telomere length/aging), #5 (racial diversity), #7(Parkinson's), #8(ACT-cloning), #10 (cloning nomenclature), #11 (religion), #12 (state initiatives), #14 (oocyte donation), #17 (diabetes), #23 (oocyte compensations), #24 (if you are not showing this video clip of the Bush veto during the activity), and #26 (PGD methods of ESCs derivation). You may choose to adapt these articles to be one-page in length for an in-class assignment. Details about choices follow below.
 - The Fox and Kirchiemer articles (#8) both address parthenogenesis but the latter provides much more scientific detail.
 - Pondrom and Immunotherapy Weekly (#18, #21) both address the contamination issues,
 - Sullivan article (#11) on religion is very long, so this should be shortened.

Activity 1: The Public Profile of Stem Cell Research

- The Entine and Brainard articles (#5) both address race as it pertains to stem cell line registries but the Brainard article is much better although not as easily accessible.
- The articles dealing with stem cell contamination and Muscular Dystrophy (MDA, Pondrom) (#6, #18) require some knowledge of molecular biology.
- The two articles by Lewis (#1, #2) in *The Scientist* both take a very detailed look at the seminal work and do an excellent job of tracing the history of stem cell research.
- The California Stem Cell Report on Ortiz's dissatisfaction with Prop71 is actually from a blog on the bill (#22).
- The Kahn article (#22) provokes discussion as it describes a health spa in Russia that delivers non-human stem cell injections for aesthetic and anti-aging purposes.
- The Sharrer article (#25) depicts a good deal of important history on the first cell line established with Henrietta Lacks cervical cancer cells. The Scientists website also has commentary on this article and I recommend using this article if you assign Chapter 1 in *Life Itself* by Boyce Rensberger as reading.
- The Wade article (#26) reviews the work by Lanza's team at Advanced Cell Technology based on preimplantation genetic diagnosis methods. Again *The Scientist* has a great blog that discusses the media embargo and the confusion with an advanced online publication going to press without adequate peer review and can be seen here <http://www.the-scientist.com/blog/display/24413/>.

Day 2 - 60 minutes

3. In this class session, each small group convenes for fifteen minutes to arrive at consensus answers for the questions above.
4. For the remainder of this class session groups share their answers with the rest of the class. Each group holds the answer to another group's questions. The discussion could last fifty-five minutes if eleven articles are used and each group presents for five minutes. It is best that you have a piece of paper with student names and groups in chart format for recording the discussion and questions that remain unanswered.
5. Take some time, perhaps in the last five minutes of class, to jot down unanswered questions that can be researched in future class sessions. You may choose to record these questions on the board and group them together so that students can see the network of issues that surround this field of research (science, ethics, law, etc.).
6. You can wrap up the discussion by reviewing any inaccuracies, discussing important points that were not mentioned, and highlighting some of the more salient points of some of the readings. You may also ask each group to indicate which group they felt did the best job in representing their views. Since the structured discussion moves quickly, having students contribute their own assessment of the discussion is an important reflective educational activity and will be very illuminating to you as well.

Activity 1: The Public Profile of Stem Cell Research

Alternatives

1. Large classes may experience difficulty conducting small group work and discussion during class time. For these classes, students can conduct their discussion online via Classwire or an email group, freeing up time during the class session for sharing the outcomes or consensus of those on-line discussions. If, however, the reading and discussion take place during the class session, shortening the news stories to one page will free up more time for small group work and class discussion.
2. Given the broad expanse of time covered in these news stories, students could conduct literature research and construct a timeline of stem cell research and cloning (note that many web sites provide timelines). Students could share these with the class via Powerpoint, poster, or transparency.

Assessment:

Since this activity is designed to stimulate interest and discussion, there is no formal assessment. However, there are options for assessment.

1. Students could submit one page summaries of their answers to the questions found in **Assignment 2**. The summaries could be based on individual work, collective responses from the small groups, or both.
2. Since small group work is involved, assessment could be conducted by the students using **Resource Two: Group Work Peer-assessment** and the **Resource Three: Group Work Self-assessment**.
3. If students construct a timeline of stem cell research discoveries and applications, these could be graded or reviewed as well. These could be shared with the class via Powerpoint presentations or posters, in which different groups of students would be responsible for covering a particular period of time. A comprehensive **Timeline** is available in the **Core Materials** section.

For a downloadable/printable version in PDF format of these pages visit [Core Materials](#)