

WHAT ABOUT STEM CELLS?

Performance Standards 12A/11A/13A/13B.H

Students will apply the concepts, principles and processes of scientific inquiry to correlate the basis of cellular and organism reproductive processes accordingly:

- *Knowledge*: understand the general basis of cellular and organism reproductive processes, as associated with stem cells in organisms.
- *Application*: review current and anticipated stem cell research applications in scientific and societal contexts.
- *Communication*: present findings about the future prospects and societal implications of stem cell research.

Procedures

1. ***In order to know and apply concepts that explain how living things function, adapt and change (12A); the concepts, principles and processes of scientific inquiry (11A); the accepted practices of science (13A); and concepts that describe the interaction between science, technology and society (13B)***, students should experience sufficient learning opportunities to develop the following:
 - Generate inquiry questions about the current societal issue surrounding the research and applications of human stem cell use.
 - Differentiate qualitative and quantitative data and their applicability.
 - Use conceptual/mathematical/physical models of stem cell sources, types, uses, etc.
 - Review general foundations of mitotic and meiotic cell division principles, stem cells, the process of healing (i.e., the inflammation process) and policies which regulate stem cell research.
 - Apply scientific habits of mind as the investigation proceeds:
 - Evaluate evidence scientifically;
 - Infer statements based on data;
 - Question sources of information;
 - Review experimental procedures and explanations for possible faulty reasoning or unproven statements; and
 - Distinguish fact from opinion and science from pseudoscience.
 - Design a scientific issue investigation about the research about stem cells, including the progression of research and its publicity.
 - Conduct the investigation, using appropriate data collection and assimilation technologies.
 - Interpret and represent analysis of issue investigation processes.
 - Report and display the process and findings of the issue investigation.
 - Analyze the correlations between scientific data, research regulatory policies and current societal perspectives.
 - Generate further questions or issues for investigation about stem cells.

Note to teacher: This activity relates to knowledge associated with Standard 12A, while addressing Performance Descriptors for Stage H within Standard 11A. Applying scientific habits of mind in Standard 13A and the societal interactions in Standard 13B are foundational. Students should already have a working knowledge of mitosis, meiosis and basic genetics. Health Occupations students will need to be able to perform research in their chosen field and determine if that research is valid. Students must be able to effectively articulate their opinion and support moral and ethical issues in medicine.

2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Begin this inquiry investigation by providing each student with copies of recent articles which provide a basic understanding of research on stem cell generation, harvesting, applications, etc. Students should gather and review additional resources from the Internet or other current publications about stem cell research and regulations surrounding this research. Students should present summaries of the articles for class discussion. Guide students to compare information from research, formal and informal publications, data tables, charts, graphic displays and projections for similarities and differences, using scientific habits of mind. Compare the survey data to correlate the relationships between scientific data, research regulatory policies and current societal perspectives. Generate additional questions to consider for future investigations about stem cells. Students should record personal interpretations of the how stem cell research should proceed. NOTE: This is a

highly controversial issue and may require additional depth of explanations of the scientific concepts, governmental regulations and political implications.

4. Evaluate each student's work using the Science Rubric as follows, and add the scores to determine the performance level:
 - *Knowledge*: Basic science concepts of cellular and organism reproductive processes associated with stem cells are referenced in context correctly.
 - *Application*: Current and anticipated stem cell research from multiple resources is referenced and summarized thoroughly and accurately.
 - *Communication*: Findings and reflections about future prospects and societal implications are presented objectively.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- One-to-three days for class review of provided articles and development of survey instrument and process
- Two-to-three days for survey
- One-to-two days for survey interpretation with group and individual reflections

Resources

- Copies of current research articles such as: Journal of Science, December 2002 – Stanford Study on Creation of Embryos as a Stem Cell Source
- What about Stem Cells? handout
- Science Rubric

Guide the students through the creation of a survey instrument for gathering information about the variety and depth of opinions about the prospects of the future of stem cell research. They should determine the questions and audience for this survey. Interview a variety of respondents such as medical experts, classroom teachers and friends, etc. Guide the students to compile the data from the survey interviews, etc. Propose applicable survey instruments, audience and questions.

WHAT ABOUT STEM CELLS? WHAT DOES IT MEAN?

Stem cell research has become a very important and highly charged area of study. Scientists are discovering ways to incorporate knowledge of stem cells to find treatments for diseases that were once thought untreatable. What an exciting time! As you begin your career in health care, you will often be faced with decisions that will be difficult.

In order to help prepare for these issues and your own decision-making processes, you will research the stem cell controversy.

1. Review normal cell division.
2. Review foundation information in class.
3. Search the Internet for more information about stem cell research, its bioethics and regulations.
4. For each article, create a bibliography card and a synopsis.
5. Evaluate the information presented
 - Is it fact or opinion?
 - Question the sources of information.
 - Determine if it is based on up-to-date information.
 - Is there faulty reasoning or faulty processing?
 - Remember, just because it is on the Internet does not make it true or unbiased.

Decide if the scientific processes, governmental regulations and societal perspectives go together. What do you think?

SCIENCE RUBRIC

Exceeds - must receive no more than one 3 and the rest 4s in the other areas of the rubric.

Meets - may receive no more than one 2 and a combination of 3s and 4s in the other areas of the rubric.

Approaches - may receive no more than one 1 and a combination of 2s, 3s or 4s, in the other areas of the rubric.

Begins - must receive at least a 1 in all 3 areas of the rubric.

	KNOWLEDGE	APPLICATION	COMMUNICATION
	Knows and understands scientific terms, facts, concepts, principles, theories and methods.	Applies scientific knowledge, skills and methods to manipulate, analyze, synthesize, create and evaluate.	Communicates scientific knowledge and applications through writing, speech and visual displays.
4	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are complete and correct. 	<ul style="list-style-type: none"> • Applications are thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Written, oral and/or visual communication is well organized and effective.
3	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are mostly complete and correct. 	<ul style="list-style-type: none"> • Applications are mostly thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Most of the written, oral and/or visual communication is well organized and effective.
2	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are somewhat complete and correct. 	<ul style="list-style-type: none"> • Applications are somewhat appropriate and accurate. 	<ul style="list-style-type: none"> • Some of the written, oral and/or visual communication is organized and effective.
1	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are minimally present or correct. 	<ul style="list-style-type: none"> • Applications are minimally appropriate and accurate. 	<ul style="list-style-type: none"> • Little of the written, oral and/or visual communication is organized and effective.
0	<ul style="list-style-type: none"> • All descriptions of scientific terms, facts, concepts, principles, theories and methods are missing and/or incorrect. 	<ul style="list-style-type: none"> • All applications are missing and/or incorrect. 	<ul style="list-style-type: none"> • All of the written, oral or visual communication is missing and/or lacks organization.
Score			