Future Battles in the War on Cancer

Vocabulary:
Students will define five vocabulary words from each article.

Lesson Summary:
Using a reading guide, students work in groups to read a science article about some aspect of current cancer research and answer questions or write a summary of their article. Students then share their information during a whole class presentation. The articles are all about different types of experimental cancer treatment including drug treatments, vaccines and personalized medicine.

Student Learning Objectives:
The student will be able to...
1. Improve scientific literacy by reading current articles on cancer research.
2. Summarize information from a scientific article in their own words.
3. Orally present scientific information to an audience.

Standards:
SC.912.L.14.6   SC.912.L.16.8   SC.912.L.16.10   SC.912.N.1.1   SC.912.N.1.2

Materials:
• Student Page: Article Reading Guide (Version I, which is more structured or Version II which is designed for more advanced students)
• Teacher Page: Rubric Lesson 7 Presentation of Journal Findings
• Selected articles for each student group (see below for suggestions for both standard and advanced students)

Standard Biology
Background Information:
Reading and reviewing other scientific research is critical in both classic “bench research” as well as clinical/translational medicine; however it is a skill that can be frustrating to the novice. In this lesson, students will have guided practice reading introductory articles. The teacher will notice a broad variety of articles suggested for this lesson, to accommodate for a wide range of reading abilities in the class.

Advance Preparation:
1. Teacher should read through the procedure and all of the articles before class.
   NOTE: Selected articles are provided at the end of this lesson for teacher reference only. Copyright laws may prevent the copying and distribution to large numbers of students.
2. Teacher must chose Version I or Version II, based on student need and print enough corresponding article copies for each group, one article per student.
   NOTE: Version II was designed to be done individually, perhaps as homework in an advanced class, which would allow this lesson to be completed in one class period.
3. Print the appropriate Student Page: Article Reading Guide
Procedure and Discussion Questions with Time Estimates:

Day ONE

1. (5-7 min) Introduce the class to the activity by saying that they will be reading articles that describe advances in cancer treatment. Remind students that even though great progress has been made in treating and preventing cancer many thousands of people still die. (You may want to refer to the timeline). Show students the following quote (which is on the student worksheet version 1):

   “Well in our country,” said Alice, still panting a little, “you’d generally get to somewhere else—if you ran very fast for a long time as we’ve been doing.”

   “A slow sort of country!” said the Queen. “Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!”

   —Lewis Carroll, Through the Looking Glass

   Ask students how this applies to cancer research. Guide students to establishing the following:

   • Cancer is caused by multiple mutations in DNA. These mutations vary in different types of cancer and from individual to individual who have the same type of cancer.
   • Therefore, it is unlikely that scientists will ever find one cure for cancer, and cancer will likely require individualized treatment.
   • At the same time scientists are developing new treatments/drugs, new mutations are allowing cancers to evolve and become resistant to therapy.

2. (30 min) Pass out copies of the articles to each group (each group will read one article). Students should read the articles and answer the questions on the worksheet.

   a. Circulate around the room to assist students as they read, etc.

Day TWO

1. (25-30 min) Give each group 5 minutes to share the content of their articles with the entire class. Allow time for students in the audience to ask the group presenters questions.

   a. If using version II, ensure that students are grouped together based on the articles they read.

2. (10 min) Share this passage from The Emperor of All Maladies by Siddhartha Mukherjee:

   “Is the end of cancer conceivable in the future? Is it possible to eradicate the disease from our bodies and our societies forever?

   The answers to these questions are embedded in the biology of this incredible disease. Cancer, we have discovered, is stitched into our genome. Oncogenes arise from mutations in essential genes that regulate the growth of cells. Mutations accumulate in these genes where DNA is damaged by carcinogens, but also by seemingly random errors in copying genes when cells divide. The former might be preventable, but the latter is endogenous. Cancer is a flaw in our growth, but this flaw is deeply entrenched in ourselves. We can rid ourselves of cancer, then, only as much as we can rid ourselves of the processes in our physiology that depend on growth-ageing, regeneration, healing, reproduction.” (page 462)

3. (3-4 min) Optional Read the story of Germaine Berne on pages 467-470 in The Emperor of All Maladies. The story illustrates how the Red Queen phenomenon (introduced on Day 1) applies to cancer.
4. (10-15 min) Have students complete the same survey about cancer that they completed in Lesson 1. Pass back their original surveys and ask them to compare their answers. Lead a class discussion about what students have learned during the course of the unit. As a written assignment you may assign a “questions journal” for homework about the five most important things they believe they learned during this unit. You may also ask students to write about ways in which this lesson personally/emotionally affected them.

Assessment Suggestions:

- To assess students understanding of the content in their articles you could collect the article worksheets and/or use the rubric on the following page to grade groups on their oral presentations to the class. We recommend completing one rubric for each student to assess students contribution to the group work in the “collaboration with peers” and “listens to others presentations” categories.
- Collect the students’ journal entries to evaluate student learning for the entire unit.

Resources/References

- NCI’s cancer therapy fact sheets: www.cancer.gov/cancertopics/factsheet/
- Explore the Vanderbilt Ingram Cancer Database at mycancergenome.org
Rubric Lesson 7: Presentation of Journal Findings

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<thead>
<tr>
<th>CATEGORY</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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<tbody>
<tr>
<td>Content</td>
<td>Shows a full understanding of the topic.</td>
<td>Shows a good understanding of the topic.</td>
<td>Shows a good understanding of parts of the topic.</td>
<td>Does not seem to understand the topic very well.</td>
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<tr>
<td>Time-Limit</td>
<td>Presentation is 5-6 minutes long.</td>
<td>Presentation is 4 minutes long.</td>
<td>Presentation is 3 minutes long.</td>
<td>Presentation is less than 3 minutes OR more than 6 minutes.</td>
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<td>Listens to Other Presentations</td>
<td>Listens intently. Does not make distracting noises or movements.</td>
<td>Listens intently but has one distracting noise or movement.</td>
<td>Sometimes does not appear to be listening but is not distracting.</td>
<td>Sometimes does not appear to be listening and has distracting noises or movements.</td>
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<td>Vocabulary</td>
<td>Uses vocabulary appropriate for the audience. Extends audience vocabulary by defining words that might be new to most of the audience.</td>
<td>Uses vocabulary appropriate for the audience. Includes 1-2 words that might be new to most of the audience, but does not define them.</td>
<td>Uses vocabulary appropriate for the audience. Does not include any vocabulary that might be new to the audience.</td>
<td>Uses several (5 or more) words or phrases that are not understood by the audience.</td>
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<td>Comprehension</td>
<td>Student is able to accurately answer almost all questions posed by classmates about the topic.</td>
<td>Student is able to accurately answer most questions posed by classmates about the topic.</td>
<td>Student is able to accurately answer a few questions posed by classmates about the topic.</td>
<td>Student is unable to accurately answer questions posed by classmates about the topic.</td>
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<td>Collaboration with Peers</td>
<td>Almost always listens to, shares with, and supports the efforts of others in the group. Tries to keep people working well together.</td>
<td>Usually listens to, shares with, and supports the efforts of others in the group. Does not cause &quot;waves&quot; in the group.</td>
<td>Often listens to, shares with, and supports the efforts of others in the group but sometimes is not a good team member.</td>
<td>Rarely listens to, shares with, and supports the efforts of others in the group. Often is not a good team member.</td>
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Total: ____ / 24
“Well in our country,” said Alice, still panting a little, “you’d generally get to somewhere else—if you ran very fast for a long time as we’ve been doing.”

“A slow sort of country!” said the Queen. “Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!”

—Lewis Carroll, Through the Looking Glass

Instructions: Read the article provided and answer the following questions as a group. As you read you may want to underline important information on your copy. All the answers to the questions must be in YOUR own words and NOT copied directly from the article. Be prepared to present the information from your article to the class.

1. Title: _______________________________________________________________________________________
   Author/s: ___________________________________________________________________________________
   Name of Journal: _____________________________________________________________________________
   Date Published: _____________________________________________________________________________

2. Define at least 5 vocabulary words from your article that you don’t know (or, if there are not five that you don’t know, choose five that are difficult) and write them with their definitions in the table below:

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<th>VOCABULARY WORD</th>
<th>DEFINITION</th>
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3. What was the purpose of the study/new clinical trial? Describe the science behind the study/clinical trial.

4. What question(s) were the scientists trying to answer?

5. How did the scientists test/implement the new treatment?

6. What conclusions or new information was learned in this study/clinical trial?

7. What other questions did the article bring up that need to be answered and/or what questions do you have after reading the article?

8. List at least two interesting facts your group learned from reading the article.
Read the article and then write a summary that includes the following components:

**Introduction:** Introduce the article by describing or defining the major ideas that relate to cancer treatment covered in the article.

**Content Summary:** They key word here is summary. Do not copy the content of the entire article. What was the article all about? What were the main scientific concepts and ideas that were discussed? What was the question(s) the author was investigating? What methods did he/she use? If the article is about clinical trials make sure to specify what phase the clinical trials were in. What evidence was uncovered to support the main body of the article?

**Evaluation:** Restate the main areas of importance in the magazine article. With your perspective as a biology student, discuss the quality of the article with regard to its relevance, importance, readability, interest level, and scientific content. Explain how this article relates to information you have learned throughout the course of this unit.

You are expected to write using appropriate grammar, sentence structure and formatting. You are also expected to use your own words when summarizing; do not plagiarize!