personal genetics education project

Social, Legal and Ethical Issues in Personal Genetics

Title: What is personalized medicine?

Aim: How will personalized medicine impact our health care?

Time: 2 days

Guiding questions:

- What are the possibilities and limits of personalized medicine?
- Why are different companies both excited and concerned about the impact of personalized medicine on their business?

Learning objectives:
By the end of the lesson, students will be able to:

- Define personalized medicine
- Explain the benefits and limits of personalized medicine
- Understand how personalized medicine may impact their own health

Materials: projector or Smartboard, laptop, markers or colored pencils, paper, handouts

Common Core Standards:
RST.11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
RST.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Before the lesson:
Students should read the following article from the *New York Times* for homework the night before the lesson: Patient's DNA May Be Signal to Tailor Medication. The article gives a good overview of how personalized medicine uses genetic tests to help identify which drugs may help or harm patients, depending on their genes. You may want to shorten the article.

Do Now:
Video and questions (7-10 min)
The following link provides a brief (2:07 min) overview answering the question, "What is Personalized Medicine?" It is a YouTube video, which we know is blocked at some schools. See below for alternatives.

Have students watch the video and answer the following questions. Students should read the questions ahead of time so they know what information they are looking for in the video. If necessary, provide students with the following definitions before the video:
Adverse - causing harm
Efficacy - the power to produce a desired result
Prone - likely to be or act a certain way
Questions:
1. How does Max's doctor choose what drugs to give him?
2. How does Max respond to the treatment?
3. How do the genetic tests Hannah undergoes impact how her doctor treats her illness?
4. How is "treating the patient" different than "treating the disease?"

If you cannot access YouTube but do have a projector, the following animated slide show provides an excellent overview.
http://learn.genetics.utah.edu/content/health/pharma/intro/
1. Why is Purinethol not helpful to all patients?
2. In the 1990's, what did researchers discover about how the drug is broken down in the body?
3. How did genetic testing impact how Latrice's doctor treated her cancer?

If you can't access a projector, here is an article that covers similar material; you will likely want to edit out some of the information, depending on time.
Questions:
1. Why has the way various medicine has traditionally been prescribed not always helped all patients?
2. Explain two ways that personalized medicine is changing medicine.
3. How has genome testing changed the way Warfarin is prescribed and how does that help patients?

After students answer questions individually, discuss answers to check for understanding.

Activity: Brochure
Students will be broken up into groups and create a brochure (either manually or using a computer, depending on your preference/resources) about the hopes, breakthroughs, and limits of personalized medicine and using patients' genetic information to improve health care. The brochure should provide an overview of personalized medicine, and address the hopes, success stories, and limits of this field. The audience for the brochure should be the general public, who may benefit from personalized medicine and would possibly encounter this brochure in a doctor's office.

Below are links to articles that will give students a good sense of this field, and specific examples of success stories and the present limits of this technology. We suggest dividing up the topics within the group and having different students read and synthesize the information for the group; each student will be held accountable for the information that he or she adds. Each brochure should address the following topics (and can certainly include more if students want to do additional research):

- Why is personalized medicine something doctors and researchers are excited about?
- How has personalized medicine helped patients?
- How might people with asthma, depression or cancer benefit from personalized medicine?
- What are the limits of personalized medicine?
- How could personalized medicine reduce health care costs in the U.S.?
- Why would some drug companies resist the move to more personalized care? How could it impact their profits?

Articles:
This article gives a brief overview of personalized medicine, and specifies some specific diseases where genetic tests have helped determine who should or should not be treated with specific drugs:
The benefits of personalized medicine

These articles give a relatively short overview of personalized medicine:
http://www.pharmacogenomics.ca/wordpress/about-us/faq
Drug Companies Pursue Personalized Medicine Approach

The following two articles are about the Beery twins, teenagers who were misdiagnosed with cerebral palsy as babies. As teenagers, they had their genomes sequenced, and were successfully diagnosed and treated. Their story is seen as an example of the true hope of personalized medicine and genome sequencing.
Gene Sequencing Helps Twins With Rare Disorder

Genome Maps Solve Medical Mystery For California Twins

These articles address two conditions that may benefit from personalized medicine:
Asthma Treatment May Be Headed Toward Personalized Medicine
On the Horizon, Personalized Depression Drugs (2007)

This article addresses the current limitations of personalized medicine:
Personalized Medicine: How Will It Affect Patients?
The short journal article from which the above is excerpted is here.

The following article refers to the potential of personalized medicine to alternately decrease and increase health costs. Students should note why some drug companies may resist the move to more tailored medical treatments.
Qiagen expands manufacturing

Process:
1. Divide students into groups of 4-5.
2. Assign each student a different article/piece of information to research (depending on your students/time, you may want to pair students to ensure that the essential information is being addressed in the brochure)
3. Students should create a rough draft of their brochure, as well as check the rubric while creating it, so they know they are meeting all of the expectations.
4. Students will either use markers/colored pencils and white paper or a computer to create the brochure.

This lesson will take two days, in order to give students time to read the articles and create the brochure. If you have extra time, you may want to increase the number of articles each student reads, or have students present a piece of their brochure to the class.

Student Name_____

Rubric:

Each student clearly worked on a particular piece of the brochure (each should add his or her name to the section s/he worked on, or you can have students write down which section they worked on and hand it in to you)	15 pts _____
Brochure addresses the following questions clearly and accurately:	
What is personalized medicine?	15 pts _____
Addresses one case of a success story	10 pts _____
Describes how PM may help patients with a specific disease	10 pts _____
The limitations of this new field	10 pts _____
How personalized medicine may impact health care costs	10 pts _____
Brochure includes at least two pictures and is neat and visually appealing	10 pts _____
The group worked together well, and clearly and evenly divided the assignments	10 pts _____
Rough Draft	10 pts _____

Total score: _____