Genomic Careers Website – Lesson Plan

Objectives

- Students will learn about the Genomic Careers website as a career planning resource.
- Students will become familiar with the website's tools.
- Working on their own, students can sign up for Career Tracker, browse the website's content, rate videos and profiles, and draw conclusions about potential careers in genomics and genetics.

Introduction

The goal of this activity is to familiarize students with the Genomic Careers website and its resources and by doing so encourage them to consider pursuing careers in fields related to genomics and genetics.

Recommended Grade Levels

High school grades 11-12.

Course/Subject

Career research/guidance.

Standards

This website can help meet state standards for career education. Please consult your state's standards for more information.

Time

15-30 minutes (possibly more, depending on undirected time students will be given to browse the website).

Activity Objectives

Understanding Objectives:

Students will understand:

- Career opportunities in the fields of genomic/genetic science
- Higher education requirements related to genomics/genetics
- The value of the internet-based career resources

Process Objectives:

How students will learn by:

- Browsing the Genomic Careers website and becoming familiar with its resources/tools
- Identifying careers that interest them and viewing related content in more detail
- Signing up for Career Tracker and tracking their progress by rating and receiving feedback

Activity Materials

Note: At the time of publication, all site content was accurate, and all URLs were valid.

Resources Needed

Genomic Careers website: http://www.genome.gov/genomicCareers

Equipment Needed

An internet-ready computer will be necessary, as will be related software and peripherals. An overhead projector will be needed to display the website efficiently to groups of students.

A key element of the website is its library of video interviews and tours, so speakers are highly recommended. The website is 508 compliant and includes transcripts and closed captioning for each video, should there be students with difficulties hearing or seeing.

It is recommended that students be allowed to browse the website independently, so a computer lab with enough computers should be reserved if possible. Alternatively, students can use the website at home, library, or other facility. Regardless, students should be encouraged to continue using the Genomic Careers website and build upon what it has to offer.

Vocabulary

Students will understand the site better if they are familiar with basic terminology related to genomics. Below are a few of the more common terms, drawn from a genetic glossary produced by the National Human Genome Research Institute. Many more terms are available there, as are illustrations and animations that can help students visualize the content.

NHGRI Talking Glossary of Genetic Terms: http://www.genome.gov/glossary

Base Pair: Two chemical bases bonded to each other forming a "rung of the DNA ladder." The DNA molecule consists of two strands that wind around each other like a twisted ladder. Each strand has a backbone made of alternating sugar (deoxyribose) and phosphate groups. Attached to each sugar is one of the four bases A, T, C, or G. The two strands are held together by hydrogen bonds between the bases (A forms a base pair with T and C forms a base pair with G).

Chromosome: An organized package of DNA found in the nucleus of the cell. Different organisms have different numbers of chromosomes. Humans have 23 pairs of chromosomes; 22 pairs of numbered chromosomes called autosomes and one pair of sex chromosomes (X and Y). Each parent contributes one chromosome to each pair so that offspring get half of their chromosomes from their mothers and half from their fathers.

DNA: Deoxyribonucleic acid; the chemical name for the molecule that carries genetic instructions in all living things. The DNA molecule consists of two strands that wind around each other in a double helix. Each strand has a backbone made of alternating sugar (deoxyribose) and phosphate groups. Attached to each sugar is one of four bases A, T, C, or G. The two strands are held together by bonds between the bases (A bonds with T and C bonds with G). The sequence of the bases along the backbones serves as instructions for assembling protein and RNA molecules.

Gene: The basic physical unit of inheritance. Genes are passed from parents to offspring and contain the information needed to specify traits. Genes are arranged, one after another, on structures called chromosomes. A chromosome contains a single long DNA molecule, only a portion of which corresponds to a single gene. Humans have approximately 23,000 genes arranged on their chromosomes.

Genome: The entire set of genetic instructions found in a cell. In humans, the genome consists of 23 pairs of chromosomes found in the nucleus as well as a small chromosome found in the cells'

mitochondria. These chromosomes, taken together, contain approximately 3.1 billion bases of DNA sequence.

Procedures and Learning Experiences

Lesson Outline

01. Opening
    - Description of genomics/genetics (as needed)
    - Influence of genomics
    - Orientation videos
02. Career Tracker
    - Purpose: Track preferred career paths, receive suggestions based on input
    - Signing up: Username and password—that's all
    - Rating videos and summaries
03. Interactive Videos
    - Interviews with professionals, tours of facilities
    - Ask a Question: Skip ahead to particular questions
    - Rating
    - Related videos
    - Search/sort features
04. Career Profiles
    - Descriptions/information: In-depth and Fast Facts
    - Rating
    - Related videos
    - Search/sort features
    - Off-site links
05. Genomics Challenge
    - Six random videos
    - Guess the career
06. Resources
    - News sources
    - Learning tools
    - Professional organizations
07. Closing
    - Independent browsing
    - Assist in signing up for Career Tracker
    - Direct students to rate videos and careers
    - Homework/in-class discussion

Lesson Walkthrough

01. Opening: Begin with a brief description of genomics/genetics if this subject hasn't been covered in class already. Students who aren't familiar with the topic aren't going to be engaged by this lesson.

Be sure to mention that advances in genomic science has changed many, many things in a very small amount of time, and the opportunities are truly astounding. Along with advances in genomic science come advances in medicine, technology, industry, and more. And beyond the obvious careers, these advances create opportunities in seemingly unrelated fields such as law, computer programming, engineering, graphic art, and so much more.

Building upon that introduction, take students to the Genomic Careers website and explain how this site ties in to what you've just discussed. The first content students should see is the Orientation videos.

These videos are brief but informative and will introduce the site's "guides." These guides will be conducting the interviews and leading students through tours of various facilities.

02. Career Tracker: Career Tracker is a key element of the Genomic Careers website. Because it is so integral, show this section of the website immediately after the Orientation videos. While it is not necessary to use the Career Tracker, it is simple to use, requires virtually no effort, and yet can help students better understand their preferences and can even make suggestions based on selections made.

Using Career Tracker begins with signing up for an account, a process as easy as selecting a username and a password. Mention that signing up involves no invasive questions, not even an email account. This is strictly for the student's convenience. (Because of its simplicity and lack of invasive questions, this also means that if they forget their username or password they will not be able to log back in and see their previous entries.) Upon registering, students can start rating the site's videos and careers profiles, and Career Tracker will start keeping track of their choices.

Stress that the more content students rate, the better Career Tracker can help them. And it is important for them to rate careers they don't think would like, as well as the ones they do think they will like. This will provide the Career Tracker with more information on which to base suggestions

03. Interactive Videos: Once you're certain that students know what the ultimate goal of the site is, show them the Interactive Videos section. Emphasize the variety to be found in these videos: Students can watch interviews with genomic professionals in their labs and offices, or they can accompany tour guides through various genomic-related facilities.

Remind students that with the longer interview videos they can use the "Ask a Question" tool to skip ahead to questions in each interview that interest them most.

Point out that each interview video (those related to a specific career) has a rating utility and that using the rating tool enables the Career Tracker to track their progress. Students can rate each item they view by assigning between one and five stars, with five stars being the highest rating. Also point out that sometimes there are related videos available, as well as links to more details about the career in the Career Profiles section.

Videos can searched based on keywords, career, or category and can be sorted by length, title, and rating.

Searches can also be performed to show just the tours, if that is preferred. Note that the tour videos do not have the rating functionality because they cover so many different careers. Also, the tours generally include a lot of short interviews. These interviews are available separate from the tours. This means, for example, that if a student searches for the career "genetic counselor", the resulting list will include both full-length interviews as well as shorter interviews that were part of the tours.

It may also be worth noting that all videos have closed-captioning and video transcripts.

04. Career Profiles: Next, take a look at the Career Profiles section. It's a collection of job descriptions and other useful information for students weighing their career options. Browse a couple of listings to illustrate the content available. Point out the Overview and Education Information sections that describe each career in detail, as well as the Fast Facts which answer some questions more succinctly (income, education required, employment prospects, etc.). Profile pages with a TV icon at the top of the profile provide a link to video(s) related to that career. When videos are available, encourage students to click through after reading a profile to learn more about the career from real-life professionals in the field.

Also at the top of each profile page, students will find the rating utility. Remind them to rate each career as they browse these profiles, just like they rate the videos. As with the videos, it is important not only to rate careers they like, but also the ones they don't, so tell them to be thorough.

On the main (search) page of Career Profiles, note that searches can be performed similar to the video section, based on general Interest Area, the Career Category, and Median Income range. The resulting search result can then be sorted by Title, Education, Income and Rating. Also on the search screen, there are arrow icons next to some career titles. These represent "play" buttons, which means these profiles have videos associated with them.

Links to more information regarding each career are available at the bottom of each profile. These links are to content produced by government agencies, universities, professional organizations, and other reputable publications and learning resources.

05. Genomics Challenge: When students are familiar with the informational resources of the Genomic Careers website, or when they just want to take a break and try a challenge, suggest they then take the Genomics Challenge.

Explain to them that real students pursuing degrees in genomics and genetics were interviewed about their backgrounds and career aspirations. Six of these interviews will play in random order and, judging by what each person says, students have to guess which career is being described.

Upon finishing the game, students will be given a score. Since the videos load randomly, the game can be played again and again, with different careers each time.

Note that the students in this game are closer in age to your students. As such, perhaps your students will be able to more closely identify with them and see the careers being discussed not as something faraway and unattainable, as it may seem when viewing the longer career interviews. These college and post-doc aged students can hopefully provide the bridge.

06. Resources: The Genomic Careers website has a large collection of links to other websites and resources dealing with genomic science and related topics. Direct students to the Resources section and show them the many categories in which further information can be found. There are links to news sources, learning tools, professional associations, sites dealing with specific fields of genomic science, and more. These sites were selected because they are administered by reputable, trustworthy organizations.

07. Closing: Allow students time to browse the website independently. Remind them to familiarize themselves with each section you've just discussed. Assist them in registering a Career Tracker account if necessary. Assigning a small homework assignment or conducting a brief in-class discussion will help bring this lesson full-circle and leave a lasting, positive impression.