Summary
Students will explore the causes and effects of heart attacks, and how regenerative medicine can help the heart. Students will research regenerative medicine using the Internet and then complete a Webquest. When finished, students will create a project of their choice.

Time 40-45 min

Standards
This activity fulfills standards in Science in Personal and Social Perspectives, and has Performance Indications regarding technology.
For full details on standards and skills please see www.sepa.duq.edu/education.
The Heart

The heart is the most important muscle in the human body because it pumps blood all throughout the body, allowing other organs to function properly. The blood delivers oxygen and nutrients to the brain, muscles, bones and organs.

The heart acts like a pump! Before each beat, the heart fills with blood. Then it contracts (squeezes) to squirt blood into the blood vessels all through the body. The heart is made of millions of special long muscle cells, called cardiomyocyte cells. The contraction (tightening) of these cells causes the heart to beat. The contractions are controlled by electrical signals that pass from cell to cell. How neat!

The right side of the heart (atrium and ventricle) receives blood from the body and pumps it into the lungs. The left side of the heart does the exact opposite: it receives blood from the lungs and pumps it out to the body. The heart does this all day and all night, every day. The heart is one hard worker!

When a heart attack occurs, heart tissue dies. Because the body cannot make new heart muscle tissue on its own, instead it makes scar tissue which is a more disorganized tissue, and weakens the heart!

Regenerative medicine helps an injured body heal faster by enhancing the body’s natural healing process. Many treatments will use young cells (stem cells) that can be found in the center of the bone - the bone marrow. These stem cells are capable of becoming new blood, bone or heart cells.

How does regenerative medicine help the heart? In the laboratory, stems cells from the bone marrow are exposed to growth factors. Growth factors are proteins that help the stem cells grow and stay healthy until they are put back in the body. In the laboratory, the stem cells multiply and grow to become new heart cells. These new heart cells are then placed on a mesh patch (which is flexible) and in turn, the patch is placed on the heart. Eventually, the cells on the flexible patch grow into new heart cells and replaced the damaged (or dead) cells. Over time, the patch is absorbed into the body. Because of regenerative medicine, the heart can continue beating normally!
Materials
- Computers (one per child)
- Internet access
- Webquest handout (provided by teacher)
- Pencils

Assessing Students
Student’s comprehension of the material will be assessed by:
- their thoroughness and completion of the Webquest
- oral/verbal communication
  - Were students on task?
  - Did they respond to questions posed during the Webquest?
  - Were students working efficiently and not wasting class time?

Process
Your students will be using the internet to explore the fascinating human heart. Students will work in pairs to complete the interdisciplinary Webquest activity during one class period (30-45 minutes). Plan for more time if you feel your students will need it. Please advise your students to follow the directions found reading guide to finish their research and check off each box as a step is completed. After all the steps on the task list is completed, students can start the evaluation assignment in class. The assignment is to be completed with their partner. Decide how many days your students will have until their assignment is due. Pairs will then present their project in front of the class.

Why Use This Webquest?
In the emerging field of tissue engineering, scientists, engineers, and medical experts are devising new ways to replace or support defective or injured body parts. They are also developing and manipulating laboratory-grown molecules, cells, tissues, or organs to heal what could not be healed before. Using this Webquest (www.sepa.duq.edu), in conjunction with Dr. Allevable’s Laboratory Website and the “Dr. Allevable and Regenerobot’s Exploration Adventure” workbook and short movie, regenerative medicine will come alive in your classroom! This Webquest, in particular, helps integrate technology into your classroom and bring your students new knowledge in a fun, interactive, and engaging manner.

Things to Consider Before Implementing this Webquest in the Classroom
- Pair students into effective cooperative partner groups (see below)
- Reserve time/class period in the computer lab
- Review proper computer lab etiquette with students
- Copy Spinal Cord Webquests for students
- Implement necessary academic adaptations (see below for suggestions)

Adaptations
- Students should work in pairs in the computer lab to create an evaluative
product. The partners can be previously chosen by the teacher to ensure that all levels of learners would be able to complete this task (i.e.- a lower-level learner may be paired with a higher-level learner). This style of pairing will help students to work collectively and practice both cooperative and social skills. Additionally, students can practice the delegation and division of roles and tasks to complete and create the assignment.

- The students will present their finished evaluative products to the entire class with their partner. As partners, they can scaffold each other’s learning and create more advanced products/ideas than if they worked on an individual basis.

- If one of your students has a visual learning impairment, feel free to create learning guides with larger print or Braille if necessary. Additionally for students with visual impairments, consider implementing the use a mouse that has a magnifying feature to aid them in reading smaller texts on a website.

- This activity should not create problems for a student with an auditory impairment as the Dr. Allevable Lab Website does not contain sound effects that would impede comprehension.