Instructional Design Template

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| **SOURCES AND INITIATION** | **Lesson Name**: Using the Rapid Chill Surgical Technique to Examine a Live Goldfish  **Instructor**:\_\_\_Rick Rossi\_\_\_ **Date:\_\_**Nov/2011\_\_  **Class**:\_\_Grade 7 Science\_\_\_\_ | | | | |
| **Part 1: Curriculum References** | | | | |
| **Content Standard:**  ***(Areas appearing in boldface are embedded in the focus of this lesson.)***  7.2 Many organisms, including humans, have **specialized organ systems that interact with each other** to maintain dynamic internal balance.  *A. Multicellular organisms need specialized structures and systems to perform basic life functions.*  *B.* ***Describe the structures of the human*** *digestive, respiratory and* ***circulatory systems, and explain how they function*** *to bring oxygen and nutrients to the cells and expel waste materials.* | **Related GLEs:**  ***(Areas appearing in boldface are embedded in the focus of this lesson.)***  *10. The major* ***parts of the human circulatory system*** *are the heart,* ***arteries, veins and capillaries****. The right side of the heart pumps blood to the lungs for gas exchange; the left side of the heart pumps the oxygenated blood around the body.*  *11.* ***The blood is made of plasma, red and white blood cells, and platelets****. Its main role is to carry small food molecules and respiratory gases (oxygen and carbon dioxide) to and from cells. Blood cells are also responsible for destroying invading particles, preventing diseases, and stopping bleeding after injuries.* | | **Content Vocabulary:***(Words appearing as boldface are embedded in the focus of this lesson.)*  **GOAL**  **capillary**  **blood vessel**  **vein**  **artery**  **pulse**  **blood plasma**  **blood cell**  **capillary bed**  white blood cell  **red blood cell (RBC)**  platelet  hemoglobin  cell respiration  homeostasis  vascular  **ADVANCED**  leukocytes  erythrocytes  **terminal arteriole**  **postcapillary venule**  albumin | **Initial Summary:**  Students will take part in a whole-group activity involving the preparation and examination of a live goldfish under a microscope. This will allow the close observation of an operating capillary bed. Often, photographs, animations, and diagrams of such living tissue do not accurately portray the real thing. This lesson will allow students to view living animal tissue, learn how to identify and define specialized structures in the circulatory system, and visualize the functions of the circulatory system. The goldfish is an ideal candidate for this activity because its coldblooded physiology allows us to manipulate it under the microscope without harm. |
| **Essential Questions:**  How do you distinguish between veins and arteries?  How does blood behave in veins, arteries, and capillaries?  How do blood cells compare in size and shape with cells in surrounding tissue. | | | | |
|  | **Part 2: Lesson Design** | | | | |
| **INSTRUCTION** | **Objective:** Students will verbally describe, define in writing, and diagram the basic structures of the vascular system by examining and discussing the living tissue in the fin of a live goldfish. | | | | |
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| **BASIC Prerequisite Knowledge:**   * The definition of a basic cell, its relative size, shape, and basic function in a multi-celled organism. * The definition of a tissue and its function in a multi-celled organism. * The basic definition of blood. * Constructing a basic definition. * Creating and labeling an informational diagram. * Effective note taking such as two-column notes or Cornell notes. | | | **ADVANCED Prerequisite Knowledge:**   * The basic cycle of cellular respiration. * The definition of homeostasis and its role in a living organism. * The difference between coldblooded and warm-blooded physiology. * The function and operation of a heart and other portions of the circulatory system.   *NOTE: ADVANCED may be moved into the BASIC field in later lessons.* | |
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| **Materials and Resources:**  [**http://www.anl.gov/Media\_Center/News/2005/ET051028.html**](http://www.anl.gov/Media_Center/News/2005/ET051028.html)  [**http://ashfordg7science.wikispaces.com/Using+Rapid+Chill+Surgical+Techniques+on+a+Live+Goldfish**](http://ashfordg7science.wikispaces.com/Using+Rapid+Chill+Surgical+Techniques+on+a+Live+Goldfish)  **For each student:** Copy of the recording sheet versions 1.1, 1.2, 1.3, copy of the article “Rapid Cooling Techniques Could Aid Surgery”, pre and post formative assessments generated from the questions listed below.  **For each lab group**: live goldfish of varying colors, 250 ml beaker, thermometer, spoon, chopped ice, spring water, sink.  **At the front of the class**: Internet access, video microscope and projector, paper towel, crushed ice, spring water, eyedropper, watch glass. | | | | |
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| **Activity Description:**  Students will break up into lab groups of three to four using the rapid chill technique described in the accompanying article to prepare a goldfish for close examination under a video microscope. Each group will be given a live goldfish, chopped ice, spring water, a thermometer, and a spoon. They will slowly add ice to the beaker, lowering the ambient temperature in the beaker to near freezing. This will be accomplished by slowly dropping small pieces of ice into the beaker containing the fish while gently stirring it with the spoon. Students will monitor the temperature with the thermometer and continue to add ice in order to assure that it is not dropping too quickly for the fish.  A fish is a coldblooded animal, so its body temperature cam be manipulated by changing the ambient temperature of the water surrounding it. Coldblooded animals living in regions that experience sub-freezing temperatures have naturally adapted to conditions similar to those being mimicked in this lab. This allows the fish to enter a dormant state that will allow it to be safely removed from water and placed under a microscope. It will remain still enough for the class to manipulate the fish’s tail into a position where the vascular network in the living tissue can be examined with the video microscope. Because the fish is not dead and its heart continues to pump blood, the vascular network will be active, allowing students to see authentic vascular movement and structure. When finished, the fish will be returned to warmer water where it will resume normal activity without harm.  Students will be able to observe in real time the activity and characteristics of the different vascular structures and identify the distinct characteristics that define them. These observations will be recorded in their journals for later discussion and analysis. | | | | |
|  | **Part 3: Learning Analysis** | | | | |
| **ASSESSMENT** | **FORMATIVE ASSESSMENT:** *(Provide two versions of each assessment question to be used in pre/post assessments.)*  **GOAL**   * (**T** or F) Individual red blood cells line up and pass through capillaries one at a time in order to move from arteries to veins. * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are the smallest blood vessels in the circulatory system where blood to crosses from arteries into veins.   A. Vesselettes **B. Capillaries** C. Aortas D. Renal tubes  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * (T or **F**) Veins are blood vessels that carry blood away from the heart. * Blood always travels to the heart in (**VEINS**, ARTERIES).   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * (T or **F**) Arteries are blood vessels that. return blood to the heart. * Blood always travels away from the heart in (VEINS, **ARTERIES**).   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * A pulse is only felt when a/an (VEIN,**ARTERY**) is pinched. * Which blood vessel must be used to feel a pulse?   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Circle the word that does not belong on the list of blood components: blood plasma, white blood cells, red blood cells, platelets, **transfusions**. * Describe the makeup of blood using the following words: blood plasma, white blood cells, platelets, red blood cells.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **ADVANCED**   * Capillaries are the main structure in the circulatory system where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  1. **the exchange of oxygen, carbon dioxide, nutrients, and waste takes place.** 2. new blood cells reproduce and grow. 3. moisture is drawn up into the body.  * (**T** or F) The exchange of substances necessary for the function of cell respiration happens in capillaries.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * (**T** or F) The pulmonary artery is the only artery in the body that does not carry oxygen rich blood. * (T or **F**) All arteries carry oxygen rich blood and all veins carry oxygen depleted blood.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   * Describe a capillary bed. * Draw a diagram of a capillary bed.   \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *NOTE: ADVANCED may be moved into the GOAL field in later lessons.* | | | | |
|  | **Part 4: Extension** | | | | |
| **SEQUENCE AND DIFFERENTIATION** | **Learning Extension and Unit Mapping:**   * During the initiation of this lesson, a reading packet entitled, “Rapid Cooling Techniques Could Aid Surgery” was given to students. Students will place this packet in their notebooks for a future lesson when students will work on **reading for information** to learn more content, and apply today’s experience/concepts to more abstract conditions. * The lab entitled “The Cryogenic Goldfish” will follow this demo. This lab is a hands-on investigation where students can experiment with a goldfish in the same way as today, but investigate the relationship between a coldblooded animal’s breath rate and body temperature. Students will use **measurement, graphing and analysis skills** to collect and analyze data from this experiment. * The lab entitled, “The dissection of a beef heart and lungs” will follow this demo as further investigation of the circulatory system. * A final a lab in this unit entitled, “The dissection of a Chicken Wing” will end the unit with a study of bone marrow and the introduction of the next unit, The Skeletal System. * Flashcards containing content/concept related information will be generated and related games such as Flashcard Bingo, Jeopardy, Flashcard Fish, can be used as study techniques and develop further reinforcement in order to maintain knowledge preceding the common assessment. | | **Differentiation Techniques:**   * **MAP scores** have been discussed with the classroom teacher who will use this data to create **three tiered skill groups**. Students will be provided with three versions of the recording worksheet based on these groups. * A video record will be posted on the Internet to be used in the following ways:   + Students who were absent can view it as makeup.   + Students who need more time processing the worksheet can revisit a visual record.   + Students who wish to extend their investigation can consider the additional questions posted with the video. * Cooperative lab groups of four students will be used when completing the hands-on preparation portion of the demo. * A communication will go home notifying parents of the day’s experience and encouraging them to view the Internet posting with their child. | | |