**Design an Organ**

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| **Major Sections** | **Content** |
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| Lesson Overview | Overall Purpose* Learn the hierarchical structure of organization in the human body
* Learn the basic anatomy of specialized cells, tissues, and organs
* Understand how cells and tissues communicate to perform essential functions
* Utilize the arts and engineering to create a depiction of a fictious organ
* Improve on collaboration, video recording skills, and presentation skills

Estimated Timeframe* Lecture: 3 hours
* Lab: 3 hours

Courses for Implementation* BIO-168: A&P 1
* BIO-112: Gen Bio 2

Key TermsStudents should know the names and functions of:* Basic cells
* Tissues (epithelial, muscular, connective, nervous)
* Organs of the human body

Standards/Skills AddressedAcademic* Compare and contrast the following systems in the human body: blood, cardiovascular, lymphatic, digestive, respiratory, urinary, and reproductive systems.
* Identify the structure and function of the organs in the systems studied.
* Demonstrate safe and proper laboratory procedures.

Technical* Learn how to use a 3D printer.
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|  | Employability* Teamwork
* Following directions
* Creative thinking
* Problem-solving
* Presenting
* Speaking
* Designing
* Professionalism

Learner Outcomes/Student Learning Objectives* Compare and contrast the following systems in the human body: blood, cardiovascular, lymphatic, digestive, respiratory, urinary and reproductive systems.
* Identify the structure and function of the organs in the systems studied.

Demonstrate safe and proper laboratory procedures. |
| Equipment/Materials | Materials/Equipment/Texts* Large paper
* Colored pencils
* Markers
* Textbooks
* 3D printer
* Video recording device

Safety Precautions * The 3D printer must be used with supervision.

Cleanup Instructions* Dispose of trash appropriately.
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| Discussion | Industry/Real-world ScenarioDr. T. Issue is a researcher at Organ Medical Labs. He leads a group of scientists who study innovative technologies. Dr. Issue and his lab assistants want to create new human organs to perform new tasks in a human body. The tasks are:* Hold, contain, and absorb water. This organ will need to stretch and relay messages to the brain when it is full/empty.
* Detect electromagnetic changes in the air and relay them to the brain. (It must be on the exterior of the body.)
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| Instructional Strategies | Proposed Teaching Strategies* Lab exercises within groups will promote collaborative learning

Bloom’s:* Lecture component: 1 Remember, 2 Understand
* Laboratory component: 3 Apply, 4 Analyze, 5 Evaluate, 6 Create

REACT:* Relate: Organs are what you have in your body
* Experience: View models of organs and describe what they do
* Apply: How tissues and cells make an organ what it is
* Cooperate: Brainstorm, create, and execute plan with a group
* Transfer: Create a fictional organ out of cells and tissues to fulfill a task
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| Activities/Lesson Procedure | Activity PreparationInstructor * Lecture on cells, tissues, and organs.
* Procure materials.

Student* Bring textbook to lab.
* Knowledge of cells, tissues, and organs required to begin lab.

Activity Steps* Lecture: Students will learn about the cells that make up the epithelial, muscular, connective, and nervous tissues. Students will learn about the functions of organs in the body.
* Lab: Student groups will be given a scenario in which they are required to design an organ (made up of two or more tissues) to perform a particular task. Groups will then produce a drawing (exterior and cross-cut) of the organ they designed. The drawing should have detail and be labeled. If applicable, groups will 3D print their organ.
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|  | * Homework: Groups will produce a 2-minute video demonstrating how their organ functions. They will introduce their scenario; describe the cells and tissues they chose that would perform the task in the scenario; present their organ; and identify the locations of the tissues and explain why they chose those locations.
* Students will vote for the organ that best completes the intended functions. This will help students reflect on their work as well as others’.

Expected Results* Students will have created a product (fictional organ) in which they can describe what their product does and why they chose the things they included.
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| Faculty Resources | Background Material* In lecture, present material on cells, tissues, and organs.
* Knowledge of 3D printers

Handouts and Supplemental Materials* Each student will be given a handout explaining what they are to do and how it will be graded.
* A 3D printer is preferred, but students may draw their organ on poster paper.
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| Assessment | How will students demonstrate what they have learned?* Students will demonstrate their understanding through their video presentation.
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|  | **Grading Rubric** | **Points** |
| **Teamwork** | 4pt: The team worked well together to achieve objectives. Each member contributed in a valuable way to the project. Members were always respectful of each other.2pt: The team worked well together most of the time, with only a few occurrences of communication breakdown or failure to collaborate when appropriate. Members were mostly respectful of each other.0pt: Team did not collaborate or communicate well. Some members would work independently, without regard to objectives or priorities. A lack of respect and regard was frequently noted. |  |
| **Product** | 4pt: The product was well designed. The underlying logic was clearly articulated and easy to follow. 2pt: The product was designed with some flaws. In some areas, the underlying logic was difficult to follow. 0pt: The product was either designed poorly or not designed at all. The underlying logic is not there. |  |
| **Video** | 4pt: Information was delivered in an organized and understandable way. Words were chosen that precisely expressed the intended meaning. Attention to the camera and body language were appropriate. A high level of professionalism was demonstrated.2pt: The way in which information was delivered was okay but could use some work. Words were well chosen with some minor exceptions. Attention to the camera and body language were slightly lacking in professionalism.0pt: The video lacked overall organization and professionalism. |  |
| **Knowledge** | 4pt: The overall product demonstrated knowledge of the course content by integrating major and minor concepts. Demonstrated evidence of extensive research effort and a depth of thinking about the topic.2pt: The overall product demonstrated knowledge of the course content by integrating major concepts into the response. Demonstrated evidence of limited research effort and/or initial thinking about the topic.0pt: The overall product did not demonstrate knowledge of the course content, evidence of the research effort, or depth of thinking about the topic. |  |
|  | **TOTAL** |  |