

Effective Understanding of the Human Body Organs: A Role-Playing Activity for Deep Learning

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ABSTRACT

In this activity, groups of students assume the roles of human body organs. They work together to acquire the knowledge needed to develop a skit to “act out” the argument that their selected organ is the most important one in the body. The students learn and reinforce their understanding of the composition and functions of organs and organ systems and how they interrelate to allow for the survival of the body as a whole while maintaining homeostasis throughout life.

Key Words: Anatomy and physiology; organ and organ system; homeostasis; critical thinking and problem solving; cooperative learning; conflict resolution; learning strategies; role playing.

Through the years, we have effectively used role playing as a learning activity to reinforce the understanding of the structure and function of human organs and their roles in the homeostasis of the human body. We have done so after discovering that while most students have no problem identifying an organ system, many have difficulty applying the definition of an organ to identify and differentiate between organs within the human body. Furthermore, among those students who have no problem identifying a human organ, it seems that many of them have difficulty identifying the different functions of the organs. The human body is a remarkable biological machine that is supported and maintained by well-designed and interdependent body systems and their unique organs, all contributing in different ways to the biological, physical, mental, and emotional health of a human being. An organ is any multicellular structural or functional unit of an animal or plant, often made up of two or more different kinds of tissues that perform a more complex and specific role than the tissue alone. Examples include the liver, a plant’s leaf, an eye, or a brain. In short, any part that is composed of a number of tissues and organized for a particular task is called an organ.

As a teaching approach, role playing is an indispensable part of human development, offers a unique way to resolve interpersonal and social dilemmas (Joyce & Weil, 1986), and is helpful in achieving learning objectives (Cherif & Somerville, 1995; Ross et al., 2008).

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Furthermore, it provides an opportunity for students to become “deep learners” by engaging in active learning. As Houghton (2004) has successfully argued, deep learning involves the critical analysis of new ideas by linking them to known concepts or principles. This linked knowledge leads to better understanding as well as long-term retention of concepts. The new ideas, now linked to familiar concepts, can be used for solving problems that are presented in unfamiliar contexts.

○ Learning Activity

The objective of this leaning activity is to help students (from middle school through high school and college levels) understand what is meant by the term “organ” and then apply this meaning in organ identification and study of the interrelationships within the human body. A second objective is to help students understand the vital roles that organs play within each organ system as well as their role in the survival of the living body and the maintenance of homeostasis throughout life.

To begin, each group of students selects a given human body organ and then designs and implements an argument that this organ is the most important one in the body. After the initial presentation of information by the instructor, the students are given time (either about 20 minutes or a couple of weeks, depending on age of students, time allowed, and points earned for this activity) to work together and collect additional information necessary to design and develop a plan. They then “act out” that plan by successfully arguing to the class that their selected organ is the most important one in the human body. The time can vary. This role-playing activity can last 2 hours or 2 weeks, including preparation and presentation time. Both time frames work well. By acting out or debating why their organ is the most important, the students learn to make choices, to organize their information, and to take on roles; they improve their social skills and academic performance; and, most of all, they learn and reinforce their understanding of the composition and function of body organs and organ systems, their interrelationships, and the roles they play in the survival and health of the living body.

○ Procedures

Before presentations:

- (1) Form a debate committee that consists of the instructor of the class, another instructor in the school, and one academically respected student from the same class (or have a “class vote/peer review” at the end of the presentations).
- (2) A day or two after introducing the organs, ask each student to write down what constitutes a body organ and then list all the organs that he or she can think of. Give the students 10–15 minutes to complete this assignment.
- (3) Without repetition of organs, ask each student to write the name of one organ from his or her list of the body organs on the blackboard, whiteboard, or large white paper.
- (4) Once the students have finished listing all their identified body organs, ask them to select the best definition for each or to modify an existing definition. Then challenge the students on their definitions until a new and clean list of body organs and their definitions is generated.
- (5) Write the name of each body organ on a separate small piece of paper (brain, heart, liver, lungs, kidney, skin, nose, pharynx, stomach, etc.), fold each paper individually, and place them in a box. Then divide the students into groups of two or three and randomly ask each group to select one body organ by picking up one piece of paper from the box.
- (6) Allow the groups to inform each other of their selections, as well as to exchange selections if they wish. This will make the groups more committed to their selections.
- (7) Give the students 2 to 3 weeks (time can be shortened or lengthened) to prepare for the debate, and inform the groups to complete the following steps:
 - (a) Research and write a well-informed paper arguing that their chosen organ is the most important organ in the human body.
 - (b) Be well prepared to engage in a meaningful debate to convince their classmates that their selected organ is the most important.
 - (c) Have a well-researched handout to be distributed to the class before the presentation, as well as an illustrated poster, poems, songs, cartoons, et cetera that can help convey the group’s message and support its argument.
 - (d) Integrate the use of technology in their presentation, such as the use of PowerPoint, animations, interactive activities, as well as songs/poems, et cetera to present their plan and strategy to show how and why their organ is the most important one in the human body.
- (8) At every class meeting, make sure that the students are working on their assignments. For example, give 15–30 minutes to the members of each group at the end of the class meeting to sit together and reflect on the progress they have made toward the written paper, poster, additional aids, and the oral presentation in which they must convince their classmates that their chosen organ is the most important.

During presentations:

- (1) The groups take turns presenting their cases to the class. The debate committee questions each group. In addition, the students in the class can ask up to three questions after a group finishes its presentation. The members of each group take note of all the questions that are asked.
- (2) When all the groups have presented their cases, the members of the debate committee can ask more questions of all the groups. The students can also ask questions, which the members of the

debate committee must consider in their final judgment and decision.

- (3) The members of the debate committee wait until the next class meeting before sharing their final decision with the groups. During this time, if there is room in the school, the posters, illustrations, and poems, et cetera can be made available for all the students to view.

After presentations:

- (1) In making their final decision, the members of the debate committee take into consideration the following:
 - (a) The academic quality and integrity of the written paper, the oral presentation, the poster illustration, and/or any additional aids used by the students to convey their message.
 - (b) The delivery of the presentations, the articulation of the arguments, the demonstration of the interrelationship between organs and organ systems, and the individual’s personal involvement and engagement during the debate.
 - (c) The type and quality of questions asked during the process. In addition, the quality of the answers the group provided to questions directed at them. Teachers and instructors can refer to Cherif et al. (2009) for useful tools and techniques that can be used to monitor the level of cognitive involvement of the members of a given group during the activity as well as to record the types of questions being asked by the members of a group, the relevance of the questions to the subject matter and to the point being debated, and the number of questions asked by the members of each group.
- (2) Each group is given 2–3 minutes to address the debate committee one more time before the members of the committee read the final decision. In these short final remarks, the groups must have a written statement that can be read to support their case.
- (3) After all the groups present their final remarks, a representative of the debate committee reads and defends the committee’s final decision.
- (4) The instructor must reinforce the concept that interrelationships and homeostasis are important for all of these organs to work effectively. (This is interesting in an evolutionary sense. When, or if, the vermiform appendix is discussed, the instructor can comment that it once was extremely important and is now vestigial.)

○ Related Activities to Reinforce & Expand upon the Learning Objectives

Related Activity 1

Many human body parts have a limited power of regeneration, which means that they are not capable of replicating and/or repairing themselves through cell division. Because of this, regrowing human limbs has been a goal of scientists for a long time. Salamanders, which are the only vertebrates known to regrow lost limbs (as well as many other body parts throughout their lifetimes), can regrow entire limbs in only 30–35 days; but they are not the only organisms with the power of regeneration (Poole, 1994; Tortora & Derrickson, 2007; Muneoka et al., 2008). Some species of zebra fish, spiders, starfish, deer, and lizards, are able to regenerate lost tissues, organs, and/or body parts. For example:

Injured zebra fish have the ability to regrow their spinal cord, retina, fins and even up to 20 percent of their heart.... Some species of sea stars can regenerate into a completely new body from nothing more than

a torn-off arm; others require a piece of the central body in order to regrow their missing parts.... Stags lose their huge antlers yearly in late fall or early winter but grow a new, larger set in time to battle for potential mates.... Spiders sometimes lose their legs when molting, but they usually grow back.... (Anonymous, 2008)

- (1) Which organ (or organs) in an adult human body is able to regenerate naturally to the extent that a living person can donate part of this organ to someone else, and within several weeks the two parts of this organ will regenerate into functioning, near-normal-sized organs?
- (2) Which organs in an adult human body are able to repair themselves after minor trauma?
- (3) What is stem cell research all about? What is tissue grafting all about?
- (4) Recently, it has been reported that Chinese researchers were able to regenerate skin from deep burns without the use of tissue grafting. What role can stem-cell research and technology play in the regeneration of human body tissues, organs, and parts?
- (5) Capitalizing on the vast accumulation of this type of knowledge, biologists hope to make regeneration of limbs and other human body parts and organs a reality. Do library research and propose a well-developed plan and procedure for how this could happen for your chosen organ.
- (6) It has been known for centuries that simple animals such as worms and starfish can be easily cloned by cutting them in half. However, this method doesn't work for higher animals because of cell specialization. Do library research to find out how scientists overcame this obstacle in cloning higher animals.

Related Activity 2

- (1) List all the organs and organ systems and the common diseases of each. Then answer the following questions:
 - (a) Which organs are the most susceptible to disease? Explain.

- (b) Which organs are the least susceptible to disease? Explain.
 - (c) Is there a relationship between the location of an organ in the human body and its susceptibility to a given disease? Explain.
 - (d) Is there a relationship between the organ system to which a given organ belongs and its susceptibility to a given disease? Explain.
- (2) List all the selected organs, their common functions, their common type of tissue, and whether or not they belong to more than one organ system.
 - (3) List all the organ systems, their estimated average weights, the estimated average human body weight, and the ratio of the organ weight to the whole body weight.

○ Homework Assignment

To reinforce the learning objectives of the activity, ask students to answer the following questions, either individually or in groups (give them a time limit, such as 10 minutes or until the next class meeting).

- (1) Reflect on the final decision made by the members of the debate committee. Do you agree with it? Why or why not?
- (2) What have you learned from the activity, academically and personally?
- (3) If you had to do this all over again, what would you change, discard, or add? Why?
- (4) On the Science Channel, the “top 10 useless body parts” were reported. Go to one of the web addresses below to read about them. Then conduct a library search to learn more about body parts such as these. Complete the following table (Table 1).
<http://science.discovery.com/top-ten/2008/organs/organs.html>
<http://science.discovery.com/top-ten/2008/organs/organs-10.html>
<http://www.jambonetwork.com/blog?p=8508>
<http://www.getlisty.com/kovr/top-10-useless-body-parts/>

○ Assessment

In assessing students' performance and understanding, as well as the effectiveness of these activities, we have been using McCormack and Yager's (1989) taxonomy for science education as a framework for student achievement. A summary of this taxonomy can be found in Cherif et al.

Table 1. To be completed by students. “Top 10 useless body parts” as reported by the Science Channel (see text), with an 11th space for the student's choice.

	“Useless” Body Part	Definition	Organ or Nonorgan? Why?	Organ System It Belongs To	Agree or Disagree with Science Channel? Why?
1.	Male nipples				
2.	Appendix				
3.	Wisdom teeth				
4.	Arrector pili				
5.	Coccyx				
6.	Tonsils				
7.	Adenoids				
8.	Sinuses				
9.	Body hair				
10.	Plica semilunaris				
11.	Your chosen body part (organ)				

(2009). In the same article, teachers and instructors can also find useful tools and techniques for monitoring the level of cognitive involvement of the members of a group during the activity and recording the types of questions being asked by the members of a group, the relevance of the questions to the subject matter and to the point being debated, and the number of questions being asked by the members of each group.

○ Conclusion

Understanding the organs is the key to understanding the intricate workings of the human body and, in turn, understanding oneself biologically, chemically, physically, and even mentally and emotionally. In this learning activity, we have tried to create a strategy of role playing that enables students to become more actively involved in learning about organs and their functions in the human body. Choosing an organ and working in groups to develop an argument for that organ motivates students to learn about organ function; to improve their communication, collaboration, and critical-thinking skills; and to have fun and enjoy learning.

The activity can be conducted before or after this topic is covered in class. In both cases, the wrap-up or ending discussion is important because it drives home the importance of homeostasis and of the interrelationships among the organ systems. In our case, this role-playing activity has benefited some of our students, from middle school to high school to college levels, by motivating them to engage in deep learning that results in a meaningful understanding of material and content.

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