AOHS Health Careers Exploration

Lesson 8

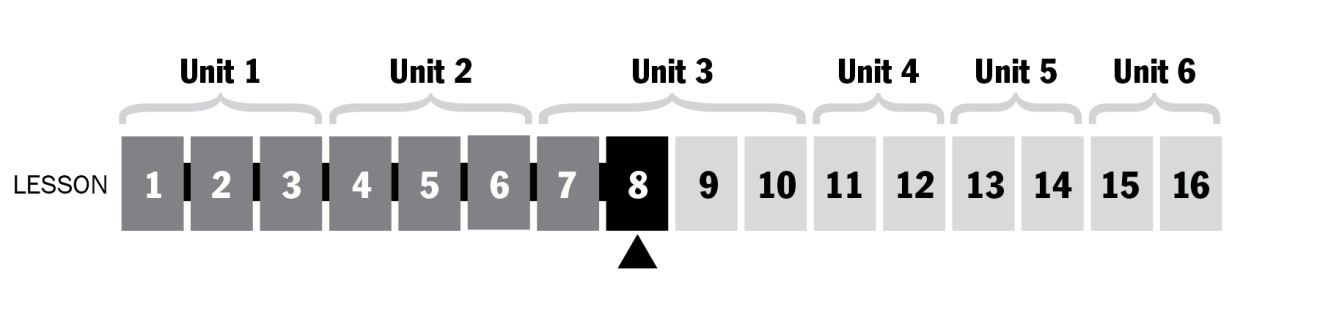
Symptoms and Tests

In this lesson students learn about the purpose of common diagnostic tests, the professionals who perform them, and how they are performed. They analyze and draw conclusions about diagnostic images and a blood test. They compare and contrast diagnostic careers and think about the skills and characteristics of people suited for each career. They hear from a guest speaker who works in the diagnostics field. For their culminating project, they choose diagnostic professions to add to their pamphlet.

Advance Preparation

* Your students may need some review or instruction of prerequisite science vocabulary for this lesson. To provide vocabulary support, use Teacher Resource 8.11, Vocabulary Support: Terms to Know for the Lesson (separate PowerPoint file). Depending on your classroom situation and the needs of your students, you can present the slides using an LCD projector and discuss the meaning of each term, print the slides as miniposters and hang them in the classroom for students to view as necessary, or print four to six slides on a page and give copies to students who need extra help with vocabulary.
* Before the lesson, you may wish to look up examples of X-rays online to share with the class. Viewing X-rays will engage students and add value to the lesson. It may be possible to ask students who have copies of X-rays at home if they’d be willing to bring them into class to share. Keep in mind though that this would be a student sharing private medical information and it should remain optional,
* Before Class Period 3, arrange for a radiologist, pathologist, or diagnostic technician (if possible, a member of your academy’s advisory board) to speak to the class. (The class visit can be either in person or remote, using Skype or Google video chat.)

This lesson is expected to take 4 class periods.



Lesson Framework

Learning Objectives

Each student will:

* Identify and compare the duties, responsibilities, and educational requirements of diverse professions within the diagnostic pathway\*
* Create appropriate interview questions for technicians and technologists to gather information about their professions
* Demonstrate knowledge of basic medical diagnostic tests
* Interpret basic data from common (sample) lab test results

\*This is one of the 16 key learning objectives assessed by the NAFTrack Certification end-of-course exam for this course.

Academic Standards

The relevant Common Core State Standards are too extensive to list here but are an important basis for this lesson. For details, please refer to the separate document “Correlations to the Common Core Standards” (available in the Course Planning Tools section of the course materials).

* Describe common diseases and disorders of each body system (prevention, pathology, diagnosis, and treatment) (National Healthcare Foundation Standards 2011, Standards 1.21)
* Analyze diagrams, charts, graphs, and tables to interpret healthcare results (National Healthcare Foundation Standards 2011, Standards 1.32)
* Apply speaking and active listening skills (National Healthcare Foundation Standards 2011, Standard 2.15)
* Classify the personal traits and attitudes desirable in a member of the healthcare team (National Healthcare Foundation Standards 2011, Standard 4.11)
* Summarize professional standards as they apply to hygiene, dress, language, confidentiality, and behavior (National Healthcare Foundation Standards 2011, Standard 4.12)
* Apply employability skills in healthcare (National Healthcare Foundation Standards 2011, Standard 4.21)
* Discuss levels of education, credentialing requirements, and employment trends in healthcare (National Healthcare Foundation Standards 2011, Standard 4.31)
* Compare careers within the health science career pathways (diagnostic services, therapeutic services, health informatics, support services, or biotechnology research and development) (National Healthcare Foundation Standards 2011, Standard 4.32)
* Apply safety techniques in the work environment (National Healthcare Foundation Standards 2011, Standard 7.31)
* Understand the roles and responsibilities of team members (National Healthcare Foundation Standards 2011, Standard 8.11)
* Recognize characteristics of effective teams (National Healthcare Foundation Standards 2011, Standard 8.12)
* Describe strategies for the prevention of disease including health screenings and examinations (National Healthcare Foundation Standards 2011, Standard 9.12)
* Identify records, files, and technology applications common to healthcare (National Healthcare Foundation Standards 2011, Standard 11.12)
* Determine academic subject matter, in addition to high school graduation requirements, necessary for pursing a health science career (Common Career Technical Core 2012, HL 1)
* Explain the healthcare worker’s role within their department, their organization, and the overall healthcare system (Common Career Technical Core 2012, HL 2)
* Evaluate the roles and responsibilities of individual members as part of the healthcare team and explain their role in promoting the delivery of quality healthcare (Common Career Technical Core 2012, HL 4)
* Communicate key diagnostic information to healthcare workers and patients in an accurate and timely manner (HL-DIA 1)
* Assess and report patient’s/client’s health status in order to monitor and document patient progress (HL-DIA 2)
* Select, demonstrate and interpret diagnostic procedures (HL-DIA 5)

Assessment

| Assessment Product | Means of Assessment |
| --- | --- |
| Quiz on basic information about diagnostic tests and the professionals who perform them (Teacher Resource 8.7) | Answer Key: Diagnostics Quiz (Teacher Resource 8.8) |

Prerequisites

* Knowledge about the basic characteristics of the diagnostic pathway
* Knowledge about professional behavior for a guest speaker visit
* Knowledge about basics of interviewing a professional for the culminating project

Instructional Materials

Teacher Resources

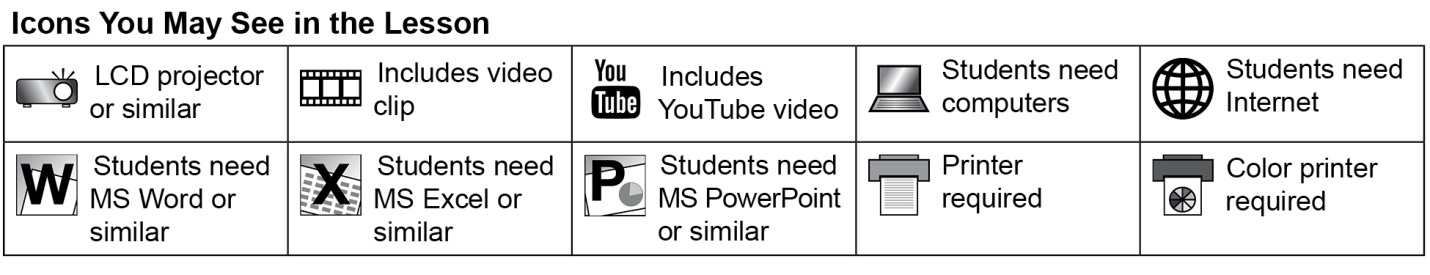
* Teacher Resource 8.1, Presentation and Notes: Diagnostic Tests (includes separate PowerPoint file)
* Teacher Resource 8.2, Answer Key: Diagnostic Tests Anticipation Guide
* Teacher Resource 8.3, Projectables: Diagnostic Images (separate PowerPoint file)
* Teacher Resource 8.4, Answer Key: Diagnostic Images Observation
* Teacher Resource 8.5, Answer Key: Reading Blood Test Results
* Teacher Resource 8.6, Guide: Preparing for a Guest Speaker
* Teacher Resource 8.7, Quiz: Diagnostics
* Teacher Resource 8.8, Answer Key: Diagnostics Quiz
* Teacher Resource 8.9, Key Vocabulary: Symptoms and Tests
* Teacher Resource 8.10, Bibliography: Symptoms and Tests
* Teacher Resource 8.11, Vocabulary Support: Terms to Know for the Lesson (separate PowerPoint file)

Student Resources

* Student Resource 8.1, Anticipation Guide: Diagnostic Tests
* Student Resource 8.2, Reading: Diagnostic Tests
* Student Resource 8.3, Observation: Diagnostic Images
* Student Resource 8.4, Analysis: Reading Blood Test Results
* Student Resource 8.5, Reference Sheets: Diagnostics
* Student Resource 8.6, Matching: Choosing the Right Diagnostic Career

Equipment and Supplies

* LCD projector and computer for PowerPoint presentations
* Whiteboard, blackboard, or flip chart



Lesson Steps

| Step | Min. | Activity |
| --- | --- | --- |
|  |  | class period 1 |
| 1 | 10 | Anticipation Guide: Diagnostic Tests  The purpose of this activity is to activate students’ prior knowledge about diagnostic tests and prepare for the reading in the next activity.  Refer students to Student Resource 8.1, Anticipation Guide: Diagnostic Tests. Tell students to agree or disagree with each statement, based on what they already know, and then write down their reason. Tell them that they will complete the “I learned” part of the activity later in the lesson. You may want to work through the first item as a class to make sure everyone understands the instructions.  After students have completed their anticipation guide, ask them to share their answers with a partner. Don't give students the correct answers at this point; they will discover the answers as they work through the presentation in the next activity.  Point out that diagnostic tests are playing an increasingly important role in health care and present opportunities for interesting careers. Tell students that they will learn more about diagnostic tests and the professionals who perform them in this lesson. |
| 2 | 20 | Presentation: Diagnostic Tests  This activity gives students an in-depth look at the purpose of common diagnostic tests, who performs them, and how they are performed. It will also get them thinking about diagnostic careers that are of interest to them. Further, the activity develops students’ listening and note-taking skills.  To prepare, make notes to guide class discussion using Teacher Resource 8.1, Presentation Notes: Diagnostic Tests. Have Teacher Resource 8.1, Presentation: Diagnostic Tests (separate PowerPoint file), ready to show as a full-screen slideshow using an LCD projector.  Instruct students to take notes during the presentation using Student Resource 8.1, Anticipation Guide: Diagnostic Tests. Tell them that during the presentation they should fill out the “I learned” part of their guide.  Present the slideshow. Use the notes you prepared and the questions on the slides to encourage class discussion.  This presentation is duplicated as Student Resource 8.2, Reading: Diagnostic Tests. If an LCD projector is unavailable, students can read the presentation, answer the discussion questions in their notebook, and discuss their answers as a class. This student resource is also useful for review.  After the presentation, go over Student Resource 8.1 as a class using Teacher Resource 8.2, Answer Key: Diagnostic Tests Anticipation Guide as a guide, and ask students to give their ideas about why they agree or disagree with each statement. Take time to clear up any outstanding questions or misunderstandings.  Point out to students that knowing the technology involved in each type of diagnostic test is an important skill that they could mention when interviewing for an internship position. |
| 3 | 20 | Analyzing Test Results: Diagnostic Images  The purpose of this activity is to provide students with an introduction to interpreting diagnostic images and lab results.  Begin the activity by asking student volunteers to share an experience of seeing a diagnostic image. For example, a student who has broken a bone may describe viewing the X-ray and having a physician point out the abnormality on the image.  Then explain that in this activity students will view several diagnostic images, and they will practice describing the image and identifying what they see.  Using an LCD projector connected to your computer, open Teacher Resource 8.3, Projectables: Diagnostic Images (separate PowerPoint file), and show the first slide to the class.  Refer students to Student Resource 8.3, Observation: Diagnostic Images. Instruct students to use this resource to take notes on their observations as they view diagnostic images. Have students read the instructions, and then answer any questions they may have.  Read aloud the question at the top of the slide. Then allow students to pair up and take a minute to discuss what they see in the image. Encourage students to make careful observations, considering what body part is shown and if they see what might be abnormalities or anything unique about the image. Then call on pairs to share their observations. You may wish to have students approach the slide and point out things that they see. Use Teacher Resource 8.4, Answer Key: Diagnostic Images Observation, to reveal the answers about what is on the slide. If you find that students are struggling to come up with interpretations of the images on their own, you may also wish to use the information in the answer key as a guide to help students understand what is being depicted in each image. Repeat the process with each slide.  To conclude this activity, point out to students that astute observation skills are a necessity for health care professionals who work in diagnostic professions. Explain that in the next class period students will continue to employ these skills when they look at more test results. |
|  |  | CLASS PERIOD 2 |
| 4 | 20 | Interpreting a Lab Report: Blood Test Results  In this activity, students continue to build on their skills by interpreting the results of a blood test.  Tell students that blood tests are common diagnostic tests ordered by physicians. Explain that doctors use blood tests to assess the health of patients. Then refer students to Student Resource 8.4, Analysis: Reading Blood Test Results. Have students work in pairs, and explain that on the top of the page is a lab report issued for a patient who had a blood test. Explain that before students begin working they should spend a few minutes reviewing the elements of the lab report, even though they may not understand what each element means. Tell them that to answer the questions on the resource they will need to use what they learn from the questions in addition to their observation skills.  After students have completed the worksheet, go over the answers as a class using Teacher Resource 8.5, Answer Key: Reading Blood Test Results.  To conclude, ask students to summarize the skills needed to understand test results. |
| 5 | 20 | Compare and Contrast: Diagnostic Services  The purpose of this activity is to expand students’ knowledge about careers in diagnostics.  Assign students to groups of five. Refer students to Student Resource 8.5, Reference Sheets: Diagnostics. Ask students to each read one sheet independently. Have groups decide who is going to read which sheet.  After students have finished reading, ask them to verbally summarize for their group the main points of the reference sheet that they read.  Then refer students to Student Resource 8.6, Matching: Choosing the Right Diagnostic Career. Tell groups that together they will read the descriptions of the different students and then decide which career would be a good fit for each student. Encourage students to refer back to their reference sheets as they work. Have groups read the instructions, and then answer any questions they may have before they get to work.  After students have finished their work, ask groups to share their answers and reasons with the class.  To conclude the activity, have students share with their group which diagnostic career they think would be best suited for them. Ask students to give at least two reasons. Have volunteers share their responses with the class. |
| 6 | 10 | Think, Pair, Share: Preparing Questions for the Guest Speaker  The purpose of this activity is to have students prepare for a guest speaker.  Tell students that in the next class period a guest speaker will visit the class. Give students the speaker’s name, profession, and the place where the speaker works. Then ask students to use what they’ve learned so far in the course to write a list of four questions in their notebook that they would like to ask the speaker. Have students share their questions with a partner, and then have pairs share their two strongest questions with the class. Make a list of the questions on the board.  Begin a discussion by asking students to share their ideas about what makes a good question. Make sure the following points are covered during the discussion:  A good question is open ended, which means it requires more than a one-word answer, like yes or no. For example, “What do you like about being a physician?” is a better question than “Do you like being a physician?”  A good question stays on topic. For example, an on-topic question is “What special training do you need to do your job?” An off-topic question is “What do you like to do after work?”  A good question requires the speaker to share his or her knowledge, experience, and opinions. Good questions often begin with phrases like “what do you think about” or “why did you decide to.”  Then, based on the discussion, guide students to determine which questions on the board are appropriate for the guest. Instruct students to come prepared to the next class period to ask at least one question.  Conclude by telling students that practicing asking thoughtful, appropriate questions will not only help them in their interviews for their culminating project, but it will also help them build skills that will help them during college and in professional interviews. |
|  |  | CLASS PERIOD 3 |
| 7 | 35 | Guest Speaker: Pathologist, Radiologist, or Diagnostic Technician  The purpose of this activity is to introduce students to a health care professional and give them a better understanding of that professional’s roles and responsibilities.  Before Class Period 3, arrange for a radiologist, pathologist, or diagnostic technician to speak to the class. If possible, arrange for someone from your academy’s advisory board. (The class visit can be either in person or conducted remotely using Skype or Google video chat.) Use Teacher Resource 8.6, Guide: Preparing for a Guest Speaker, to prepare for the speaker’s visit.  Introduce the speaker to the class by giving the class the speaker’s name, title, and work location. Tell students that the health care professional will first speak for 15 minutes about his or her work, and then students will be given an opportunity to ask questions. Write the following topics on the board and instruct students to take notes in their notebook:  Speaker’s name, title, and location of work  Background  Roles and responsibilities  Specific skills  Typical work day  Challenges  Interactions with patients and other professionals  Technology  After the speaker has given an overview of his or her work, allow students to ask questions. Encourage students to ask questions that are related either to their culminating projects or their career interests.  Conclude the activity by thanking the speaker; if time permits, allow students to shake hands and thank the speaker. Be sure someone has been assigned to write a thank-you note from the class. |
| 8 | 15 | Quiz Preparation: Diagnostics  The purpose of this activity is for students to help each other prepare for a quiz on diagnostics. This activity also focuses on the following college and career skill:  Prioritizing and completing tasks without direct oversight  Explain to students that during the next class period they will be taking a quiz on the material that has been covered during the lesson. Then write the following subjects on the board:  The purpose of different diagnostic tests  Information about the results of diagnostic tests  Information about how different diagnostic tests are performed  The roles of different professionals in diagnostics  Have students work in pairs to ask each other questions about these subjects based on their notes and the student resources that they used during the lesson.  At the end of the activity, tell students that they should review the lesson materials for homework and come to class prepared to take a short-answer quiz. |
|  |  | Class Period 4 |
| 9 | 25 | Quiz: Diagnostics  The purpose of this activity is to test students’ understanding of the material covered in this lesson.  Tell students that they will take a short-answer quiz. Ask students to put away their notes and work individually. Pass out the quiz, Teacher Resource 8.7, Quiz: Diagnostics, and have students get to work.  After students have completed the quiz, go over the answers as a class using Teacher Resource 8.8, Answer Key: Diagnostics Quiz, and clear up any misunderstandings about the material.  Conclude the activity by emphasizing that having a solid understanding about basic information about diagnostic tests will help students both understand other fields in health care and help them make career choices. |
| 10 | 25 | Culminating Project Work: Adding Professionals in Diagnostics to Pamphlets  The purpose of this activity is for students to continue to develop their culminating project by identifying professionals in diagnostics to interview. This activity focuses on the following college and career skill:  Thinking critically and systemically to solve difficult problems  Have students assemble in their culminating project groups. Write the following questions on the board:  What aspects of the interview process have gone well so far?  What would you like to do differently?  Allow students 5–10 minutes to discuss their answers. Then have groups share their responses with the class. Write their responses on the board; these may include things like “We need to ask more open-ended questions,” “We need to be more organized,” or "We are having trouble making appointments for interviews." Lead a brief discussion about ways to improve the process based on students’ responses.  Then write the following questions on the board:  Which professionals who work in diagnostics will patients with your group’s disease encounter?  Which of these professionals is it important for you to include in your pamphlet?  What are the five most important questions you need to ask these professionals?  Instruct students to discuss the questions with their group and take notes in their notebook. Explain that they should decide based on everything they’ve learned so far which professionals who work in diagnostics they want to interview, and then have them come up with thoughtful, appropriate questions they want to ask.  Tell students that as they work you will circulate to check in about their progress in interviewing health care professionals who work in a doctor’s office. Ask project managers to update their chart of the progress they have made so far, if necessary, and have it ready for you to initial. As students work, go from group to group and check to make sure that students have progressed with their first set of interviews. Also, briefly check to make sure that each group member is staying on top of his or her responsibilities.  When students have completed their work, tell them that on their own time they should begin contacting this next group of professionals to interview. Remind the interview liaisons that they are responsible for taking the lead on this aspect of the project, and also remind groups that if they have difficulty setting up interviews, they should report the problem to you so that you can help brainstorm ideas for generating contacts. Tell them that they may wish to review Student Resource 7.11, Preparation: Interviewing Health Care Professionals, before they begin their next round of interviews. Explain that they will be asked to report on their progress in setting up interviews during the next lesson.  To conclude, tell students that they have an opportunity during this next round of interviews to take their interactions with professionals to the next level by doing things like asking open-ended questions or taking more-detailed notes. |

Extensions

Enrichment

* Have students do in-depth research about bone density tests and osteoporosis. Explain to students that the results of bone density tests are reported as T scores and Z scores. Instruct students to pretend to be physicians delivering the report results to a patient who has taken a bone density test. Then ask students to give the patient advice about lifestyle changes, such as altering diet and exercise that could help increase bone strength. You may wish to have students begin their research at this site: <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0004464/>.
* Tell students that while many phlebotomists work in hospitals and medical centers, many are also employed by blood donation organizations like the American Red Cross. Have students research and create presentations that explain why blood donation is important, how blood donation works, and what the ABO Blood Group System is. You may wish to have students begin their research at this site: <http://www.redcrossblood.org/learn-about-blood/blood-facts-and-statistics>
* Explain to students that one in eight women will be diagnosed with breast cancer. Tell them that the US Preventative Services Task Force recommends that women between the ages of 50 and 74 get a mammogram every two years. Physicians believe that the screening is the best way to detect breast cancer early and can save lives. Explain that, although the screening is recommended, it is not required; patients have a choice if they want to take the screening. Instruct students to work in small groups to debate the pros and cons of screening for specific health issues (e.g., breast cancer, prostate cancer, etc.). You may wish to have students begin their research at this site: <http://www.ncbi.nlm.nih.gov/pubmed/24756610> and <http://www.breastcancer.org/research-news/false-positive-mammograms-cause-anxiety>.Tell students that a PET scan shows how tissues and organs are functioning. Have students research what a PET scan does and how it functions. Then have them create a Venn diagram to compare a CT scan and a PET scan.

Technology Integration

* Have students write a short biography of Raymond Damadian, who invented the MRI and create a digital narrative using an online storytelling tool like Simplebooklet ([www.simplebooklet.com](http://www.simplebooklet.com)), UtellStory ([www.utellstory.com](http://www.utellstory.com)), or Narrable ([www.narrable.com](http://www.narrable.com)). Ask students to include interesting and relevant information about Damadian’s education, his motivation for inventing the MRI, and his process of invention. You may wish to have students begin their research at <http://web.mit.edu/invent/a-winners/a-damadian.html>.

Cross-Curricular Integration

* History: Have students work in small groups to research and create timelines that show major events in the development of X-ray technology throughout history, including the work of Wilhelm Conrad Rontgen and Marie Curie.
* Science: Explain that often an ECG is performed while a patient is walking or running to see how physical exertion affects the heart. Have students design and perform an experiment in which they observe the effect that different types of activity, such as sprints or video gaming, have on a patient’s pulse rate. Have students keep a careful record of their data and then graph the relationship between activity and pulse rate.