

DOPPLER ULTRASOUND IN HEALTHCARE

Performance Standards 12A/12D/11B/13A/13B.I

Students will apply the processes of technological design to explain new biological technologies using the Doppler effect within health occupations accordingly:

- *Knowledge*: understand the conceptual and engineering capabilities of ultrasound technologies and the Doppler effect as a physics concept of motion.
- *Application*: research the applications of ultrasound technologies used in health occupations.
- *Communication*: compare and contrast the applications of ultrasound technologies in health care.

Procedures

1. ***In order to know and apply concepts that explain how living things function, adapt and change (12A); concepts that describe force and motion and the principles that explain them (12D); the concepts, principles and processes of technological design (11B); the accepted practices of science (13A); and concepts that describe the interaction between science, technology and society (13B)***, students should experience sufficient learning opportunities to develop the following:
 - Reference pertinent general and specific research about the applications of the Doppler effect in health care.
 - Research the scientific concepts and interactions associated with the Doppler effect.
 - Research the scientific concepts and interactions associated with ultrasound and its technologies.
 - Research the applications in health care for the Doppler effect and ultrasound technologies.
 - Research historic dilemmas that necessitated new scientific or engineering solutions, using ultrasound.
 - Identify how ultrasound applications demonstrate how scientific conclusions are open to modification as new data (and technologies) emerge.
 - Determine the success criteria and design constraints that were considered in the ultrasound choice.
 - Sketch schematics of the ultrasound devices studied.
 - Quantify benefits, costs, limitations and consequences involved in the use of the ultrasound technologies in health care.
 - Relate impact of ultrasound technologies to eventual progression of technological designs and health care applications.

Note to teacher: This activity relates to knowledge associated with Standards 12A and 12D, while addressing the Performance Descriptors for Stage I within Standard 11B. Additional connections to the scientific technologies advanced in the past century and career decisions are applicable from Standards 13A and 13B. According to the National Health Care Skills Standards, health care workers will know the academic subject matter required for proficiency within their area and be aware of the history of health care. Health Occupations students should be aware of the use of Doppler Ultrasound technology in the health care industry. Both its history of development and current use are important to know.
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Provide each student with a copy of the “Doppler Ultrasound in Health Care Idea Page.” Provide students with an overview of the scientific concepts and technological applications associated with the use of the Doppler effect in ultrasound applications in health care. Divide students into research teams or divide out topics to individuals to consider ultrasound technology in cardiac, gynecological/obstetric, abdominal, skeletal and cranial applications. Students may be able to incorporate health care site visits or interviews with health care professionals. The research should include, but not be limited to:
 - History and progression of the use and design of Doppler/ultrasound systems for the assigned application.
 - How Doppler ultrasound works in the assigned application.
 - The general and specific impact Doppler ultrasound has had in the health community and on society.
 - Risks and concerns about the use of Doppler ultrasound in the assigned application.
 - Projections for future use of Doppler ultrasound in the assigned application.

Students should present their research and compare/contrast the applications. This assessment could be used to explore other technologies (radiology, electroencephalography, tomography, electronystagmography, etc.) used in health care.

4. Evaluate each student's work using the Science Rubric as follows, and add the scores to determine the performance level:
- *Knowledge*: The explanation of the conceptual and engineering capabilities of Doppler ultrasound technologies is clear and accurate.
 - *Application*: The research on ultrasound technologies is thorough and accurate.
 - *Communication*: The comparison between ultrasound applications in health care is clear and thorough.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- Two-to-four class periods

Resources

- Access to resources including Internet sites such as www.ob-ultrasound.net/history.html
- Possible interviews of health care professionals associated with ultrasound technologies
- Doppler Ultrasound in Health Care Idea Page
- Science Rubric

DOPPLER ULTRASOUND IN HEALTH CARE

Idea Page

INVESTIGATE A DOPPLER ULTRASOUND TECHNOLOGY, AS USED IN APPLICATIONS LIKE....

- cardiac studies,
- gynecological/obstetric studies,
- abdominal studies,
- skeletal studies or
- cranial studies.

PREPARE FOR CLASS PRESENTATIONS ABOUT YOUR TECHNOLOGY SO THAT COMPARISONS AND DISTINCTIONS CAN BE DISCUSSED.

YOU MAY BE ABLE TO INTERVIEW HEALTH CARE PROFESSIONALS WHO WORK WITH ULTRASOUND FOR UP-TO-DATE INFORMATION.

TRY TO FIND DETAILS AND VISUAL AIDS ABOUT....

1. History and progression of the use and design of Doppler systems.
2. How Doppler ultrasound works.
3. The ways Doppler ultrasound is currently used in health care.
4. The impact Doppler ultrasound has had in the health community and on society.
5. Risks and concerns about the use of Doppler ultrasound (if any).
6. Projections for future use of Doppler ultrasound.

SCIENCE RUBRIC

Exceeds - must receive no more than one 3 and the rest 4s in the other areas of the rubric.

Meets - may receive no more than one 2 and a combination of 3s and 4s in the other areas of the rubric.

Approaches - may receive no more than one 1 and a combination of 2s, 3s or 4s, in the other areas of the rubric.

Begins - must receive at least a 1 in all 3 areas of the rubric.

	KNOWLEDGE	APPLICATION	COMMUNICATION
	Knows and understands scientific terms, facts, concepts, principles, theories and methods.	Applies scientific knowledge, skills and methods to manipulate, analyze, synthesize, create and evaluate.	Communicates scientific knowledge and applications through writing, speech and visual displays.
4	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are complete and correct. 	<ul style="list-style-type: none"> • Applications are thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Written, oral and/or visual communication is well organized and effective.
3	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are mostly complete and correct. 	<ul style="list-style-type: none"> • Applications are mostly thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Most of the written, oral and/or visual communication is well organized and effective.
2	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are somewhat complete and correct. 	<ul style="list-style-type: none"> • Applications are somewhat appropriate and accurate. 	<ul style="list-style-type: none"> • Some of the written, oral and/or visual communication is organized and effective.
1	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are minimally present or correct. 	<ul style="list-style-type: none"> • Applications are minimally appropriate and accurate. 	<ul style="list-style-type: none"> • Little of the written, oral and/or visual communication is organized and effective.
0	<ul style="list-style-type: none"> • All descriptions of scientific terms, facts, concepts, principles, theories and methods are missing and/or incorrect. 	<ul style="list-style-type: none"> • All applications are missing and/or incorrect. 	<ul style="list-style-type: none"> • All of the written, oral or visual communication is missing and/or lacks organization.
Score			