Unit 5 Special Senses

Content Area: **Science**
Course(s): **Anatomy and Physiology**
Time Period: **Third Marking Period**
Length: **2 Weeks**
Status: **Published**

Unit Overview

This chapter focuses on the special senses: vision, hearing and balance, olfaction, and gustation. Each of the sensory organs is described individually, but the text also emphasizes that we experience the world as a blending of the effects of various stimuli, detected by multiple special sense structures. The eye is the first of the sense organs to be presented. External eye anatomy , its accessory structures, along with the internal eye structure is described next. The ear and its role in hearing and balance are discussed next in the chapter. Static and dynamic equilibrium, detected by the vestibular apparatus, are described and differentiated, followed by a discussion of some of the more common hearing and equilibrium deficits. The chemical senses of taste and smell are presented in the final section. Chemoreceptors involved in both taste and smell respond to chemicals in solution. In the case of smell, olfactory receptors located in the roof of each nasal cavity are sensitive to a wide range of chemicals, whereas taste receptors located in the oral cavity are identified as five basic types: sweet, sour, bitter, umami, and salty. The chapter concludes with other examples of homeostatic imbalance related to the special senses.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

Cross Cutting Concepts

- Cause and Effect
- Stability and Change
- Structure and Functions

Disciplinary Core Ideas

Physical Sciences

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS1D: Information Processing

Earth and Space Sciences

Essential Questions

- How do the special senses respond to different types of energetic stimuli involved in vision, hearing, balance, smell and taste ?
- What is the role of accessories in the functioning of the special senses ?
- How do the rods and cones differ from each other ?
- What regions of the ear (external, middle, or internal) serve hearing only ?
- How do sensorineural and conductive deafness differ from each other ?
- How does sniffing help to identify scents ?

Enduring Understanding

- The eye is a complicated organ which sends visual impulses to the brain for interpretation.
- Gross anatomy of the eye.
- Pathway of light through the eye and the mechanism of vision.
- Gross anatomy of the ear.
- Mechanism of hearing and balance
- Mechanism of taste and smell.
- Diseases and disorders of the special senses.

Students will know...

Vocabulary Definitions:

Students will know the following vocabulary terms: special sense receptors, eye and its accessory structures, photoreceptors, optic disc, static equilibrium, dynamic equilibrium, conduction deafness, otosclerosis, chemoreceptors, opthalmic neonatorum, presbyopia, strabismus.

Misconceptions:

Students may think that sensory organs work by themselves without the aid of the brain.

Students may believe that the eye can see in different colors separately.

Students may think that the external ear alone plays a role in hearing.

Students often believe that balance of the human body is not a function of the ear.

Students will be able to...

- Distinguish between somatic senses and special senses.
- Analyze the relationship between the sensory organs and the brain.
- Trace the pathway of sound vibrations from the tympanic membrane to the hearing receptors.
- Assess the role of sensory structures in the functioning of the sensory organs.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- Assigned questions from text
- "Taste and smell" lab report
- Structure of the eye - labelling and coloring
- Structure of the ear - labelling and coloring
- Cow eye dissection.
- Hearing lab
- Tests
- Quizzes
- Student participation

Benchmark Assessments

Chapter test on Special Senses.

STAGE 3- LEARNING PLAN

Instructional Map

- Use 3-D models of the eye and ear to demonstrate the structural characteristics of these special sense organs.
- Use a 3-D model of the nose, and also a human skull where the cribriform plate is visible, to show the pathway of smell input, and how information from the nose can be transmitted to the brain.
- Use models to show the six extrinsic eye muscles and the movements controlled by each. Call out an eye muscle and have students perform the movement the muscle is responsible for.
- Dissect a cow's or sheep's eye so that students can observe the internal eye structures. Point out how fragile the retina is and draw attention to the fact that it is attached at a single point—the optic disc. Also, show the lens to the students and discuss how it would look with cataracts. Point out the tapedum lucidum and explain why it is not present in humans.
- Spray cologne with a light citrus-based or "woodsy" scent into the air, and ask students to raise their hands when they first smell it. Then, go on to other matters, and approximately 5 minutes later, ask how many can still smell the cologne. Use this as a jumping-off point for your discussion on adaptation of the sensory apparatus.
- Have the students all look at the same picture in their textbook. Ask them to notice any adjusting they do to bring the picture into sharper focus, such as moving the book or the position of their head. Point out that the fovea centralis exclusively contains cones.
- Perform selected vision tests, including visual acuity using Snellen's chart and color deficiency using Ishihara's color plates, and locating the blind spot.
- Provide the students with a list of the refracting parts of the eye. Have them rearrange the list to correspond with the sequence through which light would travel as it moves from the outside to the interior of the eye, prior to stimulating the rods and cones.
- Provide the students with a list of the vibrating parts of the ear. Have them rearrange the list to correspond with the sequence through which sound would travel as it moves from the outside to the interior of the ear, prior to stimulating the hair cells.
- To examine the important connection between smell and taste in the identification of foods, select one student to be the subject in the following experiment. The student closes his or her eyes and pinches the nostrils closed. Then he or she should attempt to distinguish mozzarella cheese from a hard-boiled

egg white (cut into similar sized pieces) by taste alone, taking a sip of water between samplings. If the attempt is unsuccessful, the nostrils should be released and the test conducted again. Other foods also work well, such as apples and raw potatoes, and are suitable for students who may be vegan.
- Have students put something salty, sweet, or sour on different parts of the tongue to show that there is not one specific place on the tongue that will detect salty (or sweet, sour, etc.).

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products

- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support

- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading

- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Science classes are designed around the Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in the NGSS. In grade 6, students complete a unit on "Diversity of Life". This leads into "Populations and Ecosystems" in grade 7. In grade 8, students study "Human Systems Interactions" and "Heredity and Adaptations." Following Biology in 9th grade, students take Chemistry in 10th grade. Then, students have taken this full year course of Human Anatomy and Physiology. Anatomy and Physiology being a full year course will focus on having students gain a deeper understanding of the Performance Expectations outlined in the NGSS, particularly in Life Sciences and Engineering Design. Following this course, students will the option to choose from Physics, Human Impact on the Environment, Forensics and Zoology.

Additional Materials

Online Resources:

https://sciweb.hfcc.edu/Biology/AP/234/Lecture/specialsenses/ear/ear/ear.html

https://sciweb.hfcc.edu/Biology/AP/234/Lecture/specialsenses/ear/lamar.colostate.edu/ear.html

https://sciweb.hfcc.edu/Biology/AP/234/Lecture/specialsenses/eye/version1/eyesim.htm