Health Science 3 - 5552
Human Structure and Function

Course Description:
Health Science 3 acquaints students with basic anatomy and physiology of the human body. Students learn how the human body is structured and the function of each of the 12 body systems. Students will study the relationship that body systems have with disease from the healthcare point of view. This is a very “hands on” course and students will learn through projects and activities in the classroom. Skill procedures and foundation standards are reviewed and integrated throughout the program. Job shadowing is encouraged. This course does not count as a lab science.

General Requirements: This course is recommended for students in grades 11 or 12. Required pre-requisites are successful completion of Health Science 1 or Sports Medicine 1 with a 75% or higher grade average. Students are recommended to be First Aid and CPR certified prior to this course. Students should be familiar with general medical terminology as well as technical skills associated with vital signs. (Skills learned in HS2 or SM1). This is the third course in a 4 course sequence for Health Science.

Credit: 1 or 2 unit(s)

Foundation Standards:

Foundation 1: Academic Foundations:
Understand human anatomy, physiology, common diseases and disorders, and medical math principles.

1.1 Human Anatomy and Physiology
1.1.1 Identify basic levels of organization of the human body.
   a. Chemical
   b. Cellular
   c. Tissue
   d. Organs
Identify body planes, directional terms, cavities, and quadrants.

Body planes (sagittal, mid-sagittal, coronal/frontal, transverse/horizontal).

Directional terms (superior, inferior, anterior/ventral, posterior/dorsal, medial, lateral, proximal, distal, superficial, and deep).

Cavities (dorsal, cranial, spinal, thoracic, abdominal, and pelvic).

Quadrants (upper right, lower right, upper left, and lower left).

Analyze basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive).

Skeletal (bone anatomy, axial and appendicular skeletal bones, functions of bones, ligaments, types of joints)

Muscular (microscopic anatomy of muscle tissue, types of muscle, locations of skeletal muscles, functions of muscles, tendons, directional movements)

Integumentary (layers, structures and functions of skin)

Cardiovascular (components of blood, structures and functions of blood components, structures and functions of the cardiovascular system, conduction system of the heart, cardiac cycle)

Lymphatic (structures and functions of lymphatic system, movement of lymph fluid)

Respiratory (structures and functions of respiratory system, physiology of respiration)

Nervous (structures and functions of nervous tissue and system, organization of nervous system)

Special senses (structures and functions of eye, ear, nose and tongue; identify senses for sight, hearing, smell, taste, touch)

Endocrine (endocrine versus exocrine, structures and functions of endocrine system, hormones, regulation of hormones)

Digestive (structures and functions of gastrointestinal tract, chemical and mechanical digestion, structures and functions of accessory organs)

Urinary (structures and functions of urinary system, gross and microscopic anatomy, process of urine formation, urine composition, homeostatic balance)

Reproductive (structures and functions of male and female reproductive systems, formation of gametes, hormone production and effects, menstrual cycle, and conception)

Diseases and Disorders

Describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers).

Etiology

Pathology

Diagnosis

Treatment

Prevention
1.22 Discuss research related to emerging diseases and disorders (such as: autism, VRSA, PTSD, Listeria, seasonal flu).

1.23 Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease.
   a. Gene testing
   b. Gene therapy
   c. Human proteomics
   d. Cloning
   e. Stem cell research

1.3 Medical Mathematics
1.31 Demonstrate competency in basic math skills and mathematical conversions as they relate to healthcare.
   a. Metric system (such as: centi, milli, kilo)
   b. Mathematical (average, ratios, fractions, percentages, addition, subtraction, multiplication, division)
   c. Conversions (height, weight/mass, length, volume, temperature, household measurements)

1.32 Demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.

1.33 Demonstrate use of the 24-hour clock/military time.

2: Foundation 2: Communications: Healthcare professionals will know the various methods of giving and obtaining information. They will communicate effectively, both orally and in writing.
   1. Use medical terminology and medical math to communicate information. Oral and written.
   2. Apply active speaking and listening skills

3: Foundation 3: Systems: Healthcare professionals will understand how their role fits into their department, their organization and the overall healthcare environment. They will identify how key systems affect services they perform and the quality of care.

4: Foundation 4: Employability Skills: Healthcare professionals will understand how employability skills enhance their employment opportunities and job satisfaction. They will demonstrate key employability skills and will maintain and upgrade skills, as needed.
   1. Demonstrate employability skills (as they apply to hygiene, dress, language, confidentiality, behavior and work ethic)
   2. Expand components of a personal portfolio (letter of introduction, resume, healthcare project, writing sample, work-based learning, oral presentation,
service learning, credentials, technology, and leadership experience).

3. **Participate** in healthcare **work-based learning** experiences (guest speakers, virtual tours, job shadowing, blood drives, community service projects, etc.).

5. **Foundation Standard 5: Legal Responsibilities**: Healthcare professionals will understand the legal responsibilities, limitations, and implications of their actions within the healthcare delivery setting. They will perform their duties according to regulations, policies, laws, and legislated rights of clients.
   1. **Apply** procedures for accurate documentation and record keeping.
   2. **Apply** standards for Health Insurance Portability and Accountability Act (HIPAA).

6. **Foundation Standard 6: Ethics**: Healthcare professionals will understand accepted ethical practices with respect to cultural, social, and ethnic differences within the healthcare environment. They will perform quality healthcare delivery.
   1. **Discuss** bioethical issues related to disease.
   2. **Apply ethical behaviors** in healthcare including personal, professional, and organizational ethics.
   3. **Apply procedures for reporting** activities and behaviors that affect health, safety, and welfare of others.

7. **Foundation Standard 7: Safety Practices**: Healthcare professionals will understand the existing and potential hazards to clients, co-workers, and self. They will prevent injury or illness through safe work practices and follow health and safety policies and procedures.
   1. **Demonstrate** principles of infection control using standard precautions in relation to the disease process and prevention.
   2. **Comply** with safety signs, symbols and labels.

8. **Foundation Standard 8: Teamwork**: Healthcare professionals will understand the roles and responsibilities of individual members as part of the healthcare team, including their ability to promote the delivery of quality healthcare. They will interact effectively and sensitively with all members of the healthcare team.
   1. Act responsibly as a team member.

   1. **Describe** strategies for prevention of diseases including health screenings
and examinations.

2. **Apply** practices that promote prevention of disease and injury.

10. **Foundation Standard 10: Technical Skills**: Healthcare professionals will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

1. **Revisit** procedures for **measuring and recording vital signs as you approach the appropriate body system**.
   (including recognition of normal ranges and understanding what the data means in relation to body systems and disease.)

11. **Foundation Standard 11: Information Technology Applications**: Healthcare professionals will use information technology applications required within all career specialties. They will demonstrate use as appropriate to healthcare application.

**Sample Course Outline for HS 3 – Human Structure and Function**

*This class is best taught by working in teams of 2-4.*

- Instructor/Student expectations - Standards: 2 & 4
- HOSA/Leadership - Standard: 4
- School Safety /Infection control - Standard: 7
- Job Shadowing – Standard: 4
- **Anatomy & Physiology** - Standards: 1, 2, 3, 5, 6, 8, 9, 10, & 11
- Basic Organization (1.1)
- Body Planes/Directions/Cavities (1.12)
- **Basic Structures** (1.13) (Includes location, function, disease, treatment, skills, scenarios) Diseases may be covered as you go through each system. Students can choose a disease and do a multi-media presentation to the class for some if not all systems. Discuss careers associated with each system.
- Integumentary System
- Skeletal System
- Muscular System
- Nervous System
- Special Senses
- Circulatory System (integrate pulse and blood pressure skills and parameters Standard 10.1)
- Lymphatic System
- Respiratory System (integrate respiratory skills and parameters Standard 10.1)
• Digestive System
• Urinary System
• Endocrine System
• Reproductive System
• Disease and Disorders (1.2)
  o Emerging Diseases (1.22)
  o Biomedical Therapies (1.23)

4. Medical Math - Standard: 1.3

5. Medical Terminology – Standard 2.2

All standards, should be integrated into each system, ethics, safety, infection control, teamwork, careers, technical skills, medical math and medical terminology.

Sample “Hands on Activities”
As students are learning each system there should be a hands on activity or health care skill that goes with each system. Below are some examples of how to reinforce their learning of each system.

• **Body Planes/Directions/Cavities** – orange or donut dissection, Simon Says, trace a team member and fill in cavities and label. Discuss any abnormal conditions.

• **Integumentary System** – build a 3D skin model and label the parts – all types of items may be used to simulate the consistency of the integumentary parts. Discuss disease, abnormal conditions, treatment and scenarios.

• **Skeletal System** – Using “Crunch” bars and Marshmallow treats, students can see the difference between compact and spongy bone. Number 10 bones on “Mr. Bones” your classroom skeleton, with numbered answer sheets and have a race to see who can label the bones the fastest with the correct answers. Do 10 bones every day. Discuss disease, abnormal conditions, treatment and scenarios.

• **Muscular System** – Divide into teams and build muscles on top of student volunteer. Using a clay system such as “Hands on Body Systems” build muscles and talk about muscle actions, disease and abnormal conditions. Dissect chicken legs to see muscular layers. Discuss disease, abnormal conditions, treatment and scenarios.

• **Nervous System** – Internet scavenger hunt on the brain and the full nervous system. Dissect an animal brain. Use clay to build a brain and nerves and place them in the correct anatomical position. Discuss disease, abnormal conditions,
treatment and scenarios.

- **Special Senses** – Water taste test – do a blind taste testing on different types of water and let them guess which one they think it is. Nestle, Figi, Aqua, etc. Do an eye chart test, dissect sheep eyes, do a blind touch test, or smell test. Discuss disease, abnormal conditions, treatment and scenarios.

- **Circulatory System** – Trace the flow of blood through the heart. Could be on GIANT paper as a walk-through or smaller as a drawing. Use colored markers, crayons or pencils. Label. Use clay to build a heart and place in the correct anatomical position, dissect a pig heart, label the valves, the atria, the ventricles and the main vessels. Discuss disease, abnormal conditions, treatment and scenarios.

- **Lymphatic System** – May use clay to build and place lymph nodes and vessels in the correct anatomical positions. Discuss disease, abnormal conditions, treatment and scenarios.

- **Respiratory System** – Build life size or larger than life clay lungs, with the bronchi, bronchioles, and alveoli included. Build small clay lungs and place in correct anatomical positions on clay building boards or small skeletal manikins. Discuss disease, abnormal conditions, treatment and scenarios.

- **Digestive System** – Trace the path of food from the beginning through to the end of the Alimentary Canal. Describe what is happening along the way. Build the system with clay and place it in the correct anatomical position. Label the parts. Discuss disease, abnormal conditions, treatment and scenarios.

- **Urinary System** – Test simulated urine, build the urinary system with clay and place it in the correct anatomical positions on the anatomy body building boards or manikins. Discuss disease, abnormal conditions, treatment and scenarios.

- **Endocrine System** - Build with clay and place in correct anatomical positions on boards or manikin. Assign a disease from this system to the students to present in a media fashion as these are very interesting. Discuss disease, abnormal conditions, treatment and scenarios.

- **Reproductive System** – Trace the path of the sperm from production to where they are expelled. Discuss the action of the endometrium. Discuss disease, abnormal conditions, treatment and scenarios.

**Resources:**
Browse catalog at [mysctextbooks.com](http://mysctextbooks.com) for latest instructional materials available to South Carolina public schools for health science technology courses.


Simmers, Louise. *Diversified Health Occupations*. Albany, New
York: Delmar, latest edition. ------, ------, --
-----: Teacher’s Resource Kit, latest edition.

------, ------. ------: Workbook, latest edition.

“Hands on Body Systems”
starlasteachtips.com/bodysystems.html

Starla’s Creative Teaching Tips starlasteachtips.com/

Today’s Class todaysclass.com

WEB SITES:
South Carolina Department of Education ed.sc.gov
South Carolina Health Science Education Teacher Resource Guide
cateresources.net/HSTETeacherResourceGuide/index.html Health Science Educator Resources HealthScienceTeacher.com

National HOSA - hosa.org

SC HOSA - schosa.org

National Consortium for Health Science Education - healthscienceconsortium.org

American Heart Association - americanheart.org/presenter.jhtml?identifier=1200000

American Journal of Nursing - ajn.org/

American Red Cross - redcross.org/

Annals of Internal Medicine annals.org/

Anatomy in Clay - anatomyinclay.com/

Be Something Amazing - besomethingamazing.com/

Body Works: A toolkit for healthy teens and strong families
womenshealth.gov/bodyworks/

Cancer.Net Cancer Net

CreativEd Services - creativedservices.com/
JAMA: The Journal of the American Medical Association
Medical Reserve Corps - medicalreservecorps.gov/HomePage

MedicineNet: We Bring Doctors’ Knowledge to You (Medical Dictionary)

MedlinePlus: Trusted Health Information for You
http://medlineplus.gov/

Merck: A Global Research-Driven Pharmaceutical Company
http://www.merck.com/home.html

JAMA: The Journal of the American Medical Association
http://jama.ama-assn.org/

MedicineNet: We Bring Doctors’ Knowledge to You (Medical Dictionary)

Medscape from WebMD
http://www.medscape.com/ Medical
Math Lesson Plans
http://cehd.umn.edu/NRCCTE/Math-In/MathHealth.html

Medical Mysteries on the Web http://medmyst.rice.edu/
Merck: A Global Research-Driven Pharmaceutical Company
http://www.merck.com/home.html

National Institutes of Health, Office of Science Education
http://science.education.nih.gov/lifeworks


NORD: National Organization for Rare Disorders http://www.rarediseases.org/

North Carolina Association for Biomedical Research

OncoLink: Abramson Cancer Center of the University of Pennsylvania
http://www.oncolink.upenn.edu/

Physicians’ Desk Reference http://www.pdr.net/login/Login.aspx
Pregnancy and Parenting for Today’s Mom - parenting.ivillage.com/


States’ Career Clusters www.careerclusters.org


Texas Health Science http://www.texashste.com/

U.S. Public Health Service http://www.usphs.gov/

Us TOO International Prostate Cancer Education and Support Network http://www.ustoo.com/

Web MD http://www.webmd.com/

Weil (Andrew Weil, MD) Your Trusted Health Advisor - http://www.drweil.com/

Wellness Web http://www.wellweb.com/

World Health Online http://www.healthy.net/

Yahoo Health http://dir.yahoo.com/Health_________ADD ~ www.healthscienceconsortium.org