Dental Anatomy and Physiology

PEIMS Code: N1302122
Abbreviation: DENTAP
Grade Level(s): 10-12
Award of Credit: 1.0

Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to TAC §74.13 for guidance on endorsements.

Course Description:

Dental Anatomy and Physiology is a health science course designed for exploration of the physiology of the head, neck, oral, and dental anatomy. Students will identify and describe functions of anatomical structures, including the bones, muscles, nerves, and blood vessels of the head and neck as well as their relationship to the corresponding body systems. Students will also identify and describe oral, head and neck pathologies, conditions, diagnostic tools, treatments, and professions. While this course is identified as dental, it is well suited for all students interested in pursuing any of the professions involved with the head and neck such as dentistry, otolaryngology, optometry, radiology, audiology, neurology, reconstructive/plastic surgery.

Essential Knowledge and Skills:

(a) General Requirements. This course is recommended for students in Grades 10-12. Recommended prerequisites: Biology and Introduction to Dental Science. Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Dental Anatomy and Physiology course is a health science course designed for exploration of the anatomy and physiology of the head, neck, oral, and dental anatomy. Students will identify and describe functions of anatomical structures, including the

bones, muscles, nerves, and blood vessels of the head and neck as well as their relationship to the corresponding body systems. Students will also identify and describe oral, head and neck pathologies, conditions, diagnostic tools, treatments, and professions.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to learn the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(8) Statements that contain the word “including” reference content that must be mastered, while those containing the phrase “such as” are intended as possible illustrative examples.

(c) Knowledge and Skills.

(1) The student demonstrates professional and ethical standards, employability skills as required by the healthcare industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) cooperate, contribute, and collaborate as a member of a team;

(C) demonstrate professionalism, attention to detail, and problem-solving skills; and

(D) explain the importance of the Health Insurance Portability and Accountability Act (HIPAA) and patient privacy and confidentiality.

(2) The student analyzes the structure and function of the head and neck region of the body in relation to human body systems. The student is expected to:

(A) identify anatomical structures of the head and neck, including the skull, sinuses, nasal cavity, intraoral and extraoral structures, throat, and ear using correct medical and dental terminology;

(B) describe the functions of the anatomical structures of the head and neck;

(C) explain the relationships of the anatomical structures of the head and neck to various corresponding body systems, including the nervous, circulatory, respiratory, muscular, skeletal, and digestive systems;

(D) distinguish between the types of tissues that form the head and neck structures; and

(E) identify and describe microscopic examples of various types of tissue found in the head and neck, including the tissues comprising the oral mucosa, submucosa, alveolar bone, and salivary gland ear using correct medical and dental terminology.

(3) The student describes the relationship of the landmarks of the oral cavity to the overall functions of the mouth. The student is expected to:

(A) describe the boundaries and sub-boundaries of the oral cavity using models;

(B) identify the landmark structures of the oral cavity;

(C) describe the function of the oral cavity structures, including the tongue, teeth, mucosa, gingiva, and salivary glands using models;

(D) explain the role saliva plays in the oral cavity;

(E) diagram the location and describe the function of the various taste buds; and

(F) describe the sequence of events that occurs when swallowing.

(4) The student explains the anatomical structures and functions of the various types of teeth in the dentition. The student is expected to:

(A) identify incisors, cuspids, premolars, and molars, including the crown, cementoenamel junction (CEJ), root, line angles, point angles, facial height of contour, and root furcation (where applicable) using models;

(B) identify terms used to represent the locations and surfaces in the oral cavity, including buccal, labial, incisal, occlusal, mesial, distal, ventral, dorsal, and lateral;

(C) describe the function of each type of tooth;

(D) explain the relationship between the structure of each type of tooth and its function in mastication; and

(E) model the distribution of forces throughout a tooth and its supporting structures during mastication.

(5) The student describes the histology and embryology of the oral cavity. The student is expected to:

(A) describe the embryological origins of the oral cavity, including the formation of the enamel, cementum, dentin, pulp, and periodontal fibers;

(B) describe the chronological timeline of the development of the primary and secondary dentitions;

(C) contrast primary, secondary, and mixed dentitions; and

(D) identify the conditions resulting from atypical morphology of the oral cavity structures, including genetic defects such as cleft lip or cleft palate.

(6) The student identifies and explains the functions of the major nerves, muscles, and blood vessels found in the face and oral cavity. The student is expected to:

(A) identify the locations, including origin and insertion points, of the muscles of face and oral cavity such as those responsible for facial expression and mastication;

(B) identify the major branches of the facial nerves;

(C) create a model to identify the locations of the muscles, vessels, and major nerves of the head and neck; and

(D) explain the movements of the Temporomandibular Joint (TMJ).

(7) The student identifies and understands common pathologies of the oral cavity. The student is expected to:

(A) differentiate between bacteria and viruses;

(B) explain the role of bacteria in caries and periodontal disease;

(C) investigate and explain the impact of acids on tooth enamel;

(D) identify characteristics of oral pathologies such as lichen planus, candidiasis, herpes simplex virus, apthous ulcer, black hairy tongue, geographic tongue, lesions, pemphigus vulgaris, nicotine stomatitis, hypocalcification, tetracycline staining, or hyperkeratosis;

(E) identify the lymph nodes involved in head and neck pathologies;

(F) analyze data from fictional medical histories to predict the impacts on the functions of facial and/or oral structures;

(G) assess the impact of environmental factors on the structures of the oral cavity such as pacifiers, night-time bottle use, thumb-sucking, drug and alcohol use, or tobacco use;

(H) identify and explain the oral side effects of medications such as those prescribed for high blood pressure, epilepsy, pain, allergy and cold, diabetes, heart disease, radiation therapy and chemotherapy; and

(I) describe the roles, functions, and responsibilities of regulatory agencies, including Centers for Disease Control (CDC), Occupational Safety and Health Administration (OSHA), and the Texas State Board of Dental Examiners (TSBDE) in governing infection control in the dental setting.

(8) The student understands the diagnostic tools used in the head and neck region. The student is expected to:

(A) identify and explain the mechanisms of the diagnostic tools used in the head and neck region, including intraoral and extraoral radiographs, Cone Beam Computed Tomography (CBCT), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and biopsies;

(B) explain the use of radiation in the diagnosis of conditions of the head and neck;

(C) identify anatomical landmarks commonly found on diagnostic images; and

(D) explain the Occupational Safety and Health Administration (OSHA) requirements for radiation safety in the workplace.

(9) The student understands the role of healthcare providers in the prevention and treatment of dental conditions. The student is expected to:

(A) explain the importance of preventative oral health care;

(B) demonstrate prevention methods for various dental conditions such as caries, halitosis, and periodontal disease;

(C) describe the types of dental restorations such as fillings, crowns, bridges, and implants;

(D) identify common restorations on radiographs; and

(E) explain the most likely treatment for various conditions, including caries of the anterior and posterior teeth, bruxism, oral cancer, avulsed teeth, fractures, periodontal disease and TMJ issues.

(10) The student uses critical thinking, scientific reasoning, and problem solving to educate patients. The student is expected to:

(A) explain how a sleep-related breathing disorder such as sleep apnea can be detrimental to a patient's oral health;

(B) explain bruxism (need for nightguard), tooth replacement (for a congenitally missing or lost tooth), and orthodontics (for misaligned teeth or abnormal bite) using models; and

(C) prepare a presentation of the effects of bacteria in the oral cavity and the importance of preventative oral care.

(11) The student assesses career options for professions involved with the care of the head and neck region. The student is expected to:

(A) investigate and present on education requirements and qualifications for different career pathways that require a knowledge of head and neck anatomy, including professions in dental and medical fields as well as speech pathology and audiology;

(B) research and analyze emerging employment trends for identified careers; and

(C) define interprofessional collaboration and explain how a dental professional would interact with various careers.

Recommended Resources and Materials:

Brand, Richard W., and Donald E. Isselhard. *Anatomy of Orofacial Structures. 8th ed*. St. Louis, Missouri: Elsevier, 2018.

Fehrenbach, Margaret J. *Dental Anatomy Coloring Book. 3rd ed.* Saunders, 2019.

Fehrenbach, Margaret J. and Susan W. Herring. *Illustrated Anatomy of the Head & Neck. 5th ed*. St. Louis, Missouri: Saunders, 2016.

Fehrenbach, Margaret J. and Tracy Popowics. *Illustrated Dental Embryology, Histology, and Anatomy. 4th ed*. Maryland Heights, Missouri: Elsevier/Saunders, 2016.

- accompanying student workbook-paper or e-book available
- images of microscopic slides

Iannucci Haring, Joen and Laura Jansen Lind. *Radiographic Interpretation for the Dental Hygienist. 1st ed.* Philadelphia, Pennsylvania: Saunders, 1993.

- intra and extraoral radiographs of healthy and diseased head and neck structures

Nelson, Stanley J. *Wheeler's Dental Anatomy, Physiology, and Occlusion. 11th* ed. St. Louis, Missouri: Elsevier, 2020.

Short, Marjorie J. and Deborah Levine-Goldstein. *Head, Neck, and Dental Anatomy. 4th ed*. Clifton Park, New York: Delmar Cengage Learning, 2013.

- Models: Axis Scientific Life-Size Human Skull with Removable Muscles, Axis Scientific Half Head with Muscles, Nerves and Vasculature, Axis Scientific Didactic Skull on Cervical Vertebrae with Nerves and Arteries
- ES 14/1 Development of a Set of Teeth https://www.somso.de/en/anatomie/head-neck/oral-cavity/development-of-teeth/es-141/
- University of Dundee School of Dentistry 3D Oral Cavity https://sketchfab.com/3d-models/oral-cavity-64d4e31440ba48ee9e1ecccf6fe0ac17
- Mouth & Tooth Models https://anatomywarehouse.com/body-parts/head-and-neck/mouth/mouth-models/

Recommended Course Activities:

- Label the anatomical landmarks of both the skull and oral cavity using a skull/model.
- Conduct microscopic investigations of the types of tissue found in the oral cavity.
- Develop a model that demonstrates the distribution of forces on the tooth, periodontal ligament, and alveolar bone during mastication.
- Create a model of the location of the muscles, blood vessels, and major nerves of the head and neck using balloons and string on the skull models.
- Draw anatomically correct diagrams of incisor, cuspids, premolars, and molars.
- Create and deliver a career pathway or effective dental preventative care presentation.

Suggested methods for evaluating student outcomes:

- Lab Practical: Matching landmark names to the actual anatomical structure on a skull model
- Quizzes in a variety of formats (multiple choice, matching, or drag-and-drop for formative and summative quizzes) to gauge mastery of items such as identifying each type of tooth by its morphology, structures and functions of the head and neck region, along with general terminology
- Oral presentations demonstrating content knowledge, use of technology, and employability skills
- Patient education materials for items such as preventative oral health care, the role of bacteria in dental pathology, dangers to the oral cavity from tobacco, the need for diagnostic x-rays (Flipgrid, Screencastify, Canva, are some possible tools to be used for this activity.)
- Traditional multiple choice and constructed response assessments

Teacher qualifications:

An assignment for Dental Anatomy and Physiology is allowed with one of the following certificates:

- Health Science: Grades 6-12.
- Health Science Technology Education (Grades 8-12).
- Vocational Health Occupations.
- Vocational Health Science Technology.

Recommended: U.S. Licensed Dentist, U.S. Licensed Dental Hygienist, Dental Assistant, or Dental Laboratory Technician or related work experience.

Additional information: