

Topic 2: Exercise Physiology

Content Area: **Science**

Course(s): **IB Sports, Exercise & Health Science**

Time Period: **1st Marking Period**

Length: 7 weeks

Unit Overview

Ventilatory: Students will be able to identify the structures of the respiratory tract as well as describe their associated functions. This will give them a foundation for understanding the various stages of breathing and lung volumes. They will not only be able to describe the mechanics of ventilation, but also the chemical and nervous control of it. On a microscopic level, students will be able to describe the exchange of respiratory gases in the alveoli and the role of hemoglobin in the transportation of oxygen on red blood cells, tying the ventilatory system into the cardiovascular system.

Cardiovascular: Students will be able to describe the composition of blood, and its function. They will be able to distinguish among the different formed elements by their function. Students will be able to identify the basic structures of the heart and be able to differentiate among them by function. Their knowledge of muscular tissue will help them to understand and explain the intrinsic and extrinsic regulation of heart rate and cardiac muscle excitation. This will allow them to describe the relationship between heart rate, cardiac output and stroke volume while at rest as well as during exercise. Students will be able to describe the difference between pulmonary and systemic circulation. They will then be able to describe how blood redistributes during different types of exercise. Students will learn to take blood pressure readings in order to understand what systolic and diastolic readings represent, discuss how they fluctuate in response to dynamic vs static exercise and analyze readings from such events. With a deep understanding of these various activities of the heart, students will be able to describe the phenomenon of "cardiovascular drift". With a complete knowledge of the ventilatory and cardiovascular systems students will be able to describe concepts like maximal oxygen consumption and the variabilities that affect this in various populations as well as different modes of exercise.

STAGE 1- DESIRED RESULTS

2020 New Jersey Student Learning Standards- Science

DCI: HS-LS1-2, HS-LS1-3

CCC: Cause & Effect, Systems and System Models, Energy and Matter, Structure and Function, Stability and Change

S&EP: Asking questions/defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations, engaging in argument from evidence, obtaining, evaluating & communicating information

Essential Questions

How does the body acquire and deliver the body with the oxygen it needs and expel its carbon dioxide waste during exercise in order to maintain homeostasis?

Enduring Understanding

Students will understand the dynamic balance between the ventilatory and cardiovascular system that work to deliver oxygen to the body at rest and during exercise as well as how it prevents the build up of metabolic waste products.

Students will know...

Vocabulary: nose, mouth, pharynx, larynx, trachea, bronchi, bronchioles, lungs, alveoli, conducting airway, pulmonary ventilation, total lung capacity, vital capacity, tidal volume, expiratory reserve volume, inspiratory reserve volume, residual volume, diaphragm, external intercostal muscles, abdominal muscles, hemoglobin, respiratory gases, diffusion, erythrocyte, leucocyte, platelet, atrium, ventricle, aorta, bicuspid valve, tricuspid valve, vena cava, pulmonary vein, pulmonary artery, pulmonary circulation, systemic circulation, coronary circulation, heart rate, cardiac output, stroke volume, cardiovascular drift, systolic blood pressure, diastolic blood pressure, maximal oxygen consumption

Students will be able to...

- 2.1.1 list the principal structures of the ventilatory system
- 2.1.2 outline the functions of the conducting airways
- 2.1.3 define the terms *pulmonary ventilation*, *total lung capacity (TLC)*, *vital capacity (VC)*, *tidal volume (TV)*, *expiratory reserve volume (ERV)*, *inspiratory reserve volume (IRV)* and *residual volume (RV)*
- 2.1.4 explain the mechanics of ventilation in the human lungs
- 2.1.5 describe nervous and chemical control of ventilation during exercise
- 2.1.6 outline the role of hemoglobin in oxygen transportation
- 2.1.7 explain the process of gaseous exchange at the alveoli

- 2.2.1 state the composition of blood
- 2.2.2 distinguish between the functions of erythrocytes, leucocytes, and platelets
- 2.2.3 describe the anatomy of the heart with reference to the heart chambers, valves and major blood vessels
- 2.2.4 describe the intrinsic and extrinsic regulation of heart rate and the sequence of excitation of the heart muscle
- 2.2.5 outline the relationship between the pulmonary and systemic circulations
- 2.2.6 describe the relationship between heart rate, cardiac output and stroke volume at rest and during exercise
- 2.2.7 analyze cardiac output, stroke volume and heart rate data for different populations at rest and during exercise
- 2.2.8 explain "cardiovascular drift"
- 2.2.9 define the terms *systolic* and *diastolic* blood pressure
- 2.2.10 analyze systolic and diastolic blood pressure data at rest and during exercise
- 2.2.11 discuss how systolic and diastolic blood pressure respond to dynamic and state exercise
- 2.2.12 compare the distribution of blood at rest and the redistribution of blood during exercise
- 2.2.13 describe the cardiovascular adaptations resulting from endurance exercise training
- 2.2.14 explain maximal oxygen consumption
- 2.2.15 discuss the variability of maximal oxygen consumption in selected groups
- 2.2.16 discuss the variability of maximal oxygen consumption with different modes of exercise

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

Draw/label – conducting airway diagram and use it to describe ventilation

Investigation – respiratory rate

Interpret – learn how to interpret spiograph

Investigation – lung capacity

Investigation – ventilation in response to exercise

Draw/label – heart diagram and use it to describe systemic and pulmonary circulation

Interpret – data representing cardiovascular drift, comparing trained athletes vs novice

Investigation – blood pressure/pulse rate, learn how to take blood pressure and interpret results

Interpret – learn how to interpret EKG

Investigation – practice placing leads, collecting data and analyzing results during rest, casual movement and exercise

Benchmark Assessments

2.1 Quiz

2.2 Quiz

UNIT 2 TEST (comprised of Paper 1 & Paper 2 type questions)

STAGE 3- LEARNING PLAN

Instructional Map

Preview “I can” statements to identify learning objectives

Learn the structures of the ventilatory & cardiovascular systems

Learn how to use and interpret data from spirometers, sphygmomanometers and EKG Practice describing physiology from data

Review “I can” statements to self-assess knowledge

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

Peer Tutoring

Repeated Drill and Practice

Cooperative Grouping

Teacher notes

Use of additional reference materials

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 Assignment
- 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 Integration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

9th grade – Biology
 10th grade – Chemistry
 11th grade – Anatomy & Physiology
 12th grade – Physics

Additional Materials

Sports, Exercise and Health Science by Oxford University Press (classroom set & PDF in Canvas)

