

Topic A: Optimizing Physiological Performance

Content Area: **Science**

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

Time Period: **4th Marking Period**

Length: 5 weeks

Unit Overview

Training: Students will learn to distinguish between physical activity and training for a sport/fitness goal by learning the components of training and how to measure indicators of training and overtraining.

Environmental factors and physical performance: Students will learn the benefits/detriments of training in a variety of environments by understanding how the body responds and accommodates during exercise to extremes temperatures (hot and cold).

Non-nutritional ergogenic aids: Students will learn about the different types of aids, their impact on the body, why athletes might be tempted to use them and the side effects of non-nutritional ergogenic aids.

STAGE 1- DESIRED RESULTS**2020 New Jersey Student Learning Standards- Science**

DCI: HS-LS1-2, HS-LS1-3, HS-LS1-6

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 can athletes optimize physiological performance?

Enduring Understanding

Students will learn how to optimize training and preparation for sporting events/seasons with a consideration for internal and external factors.

Students will know...

Vocabulary: training, overtraining overreaching, circuit, interval, plyometrics, fartlek (speed play), cross-training, periodization, metabolism, physiological, thermoregulate, sweat response, heat stroke, heat cramps, heat exhaustion, humidity, acclimatization, surface area, body mass, wind chill, frostbite, hypothermia, hyperthermia, ergogenic aid, placebo effect, anabolic steroid, hormones, diuretics, masking agents, erythropoietin (EPO), beta blockers, stimulants, pharmacological substances, International Olympic Committee (IOC), World Anti-Doping Agency (WADA)

Students will be able to...

- A.1.1 distinguish between training, overtraining and overreaching
- A.1.2 describe various methods of training
- A.1.3 discuss possible indicators of overtraining
- A.1.4 discuss how periodization should be organized to optimize performance and avoid overtraining and injury
- A.2.1 explain the relationship between cellular metabolism and the production of heat in the human body
- A.2.2 state the normal physiological range for core body temperatures
- A.2.3 outline how the body thermoregulates in hot and cold environments
- A.2.4 discuss the significance of humidity and wind in relation to body heat loss
- A.2.5 describe the formation of sweat and the sweat response
- A.2.6 discuss the physiological responses that occur during prolonged exercise in the heat
- A.2.7 discuss the health risks associated with exercising in the heat
- A.2.8 outline what steps should be taken to prevent and to subsequently treat heat-related disorders
- A.2.9 describe how an athlete should acclimatize to heat stress
- A.2.10 discuss the physiological and metabolic adaptations that occur with heat acclimatization
- A.2.11 outline the principal means by which the body maintains core temperature in cold environments

- A.2.12 explain why the body surface area to body mass ratio is important for heat preservation
- A.2.13 outline the importance of wind chill in relation to body heat loss
- A.2.14 explain why swimming in cold water represents a particular challenge to the body's ability to thermoregulate
- A.2.15 discuss the physiological response to exercise in the cold
- A.2.16 describe the health risks of exercising in the cold, including cold water
- A.2.17 discuss the precautions that should be taken when exercising in the cold
- A.3.1 define the term ergogenic aid
- A.3.2 describe, with reference to an appropriate example, the placebo effect
- A.3.3 list five classes of non-nutritional ergogenic aids that are currently banned by the International Olympic Committee (IOC) and the World Anti-Doping Agency (WADA)
- A.3.4 discuss why pharmacological substances appear on the list of banned substances
- A.3.5 discuss the proposed and actual benefits that some athletes would hope to gain by using anabolic steroids, erythropoietin (EPO), beta blockers, caffeine and diuretics
- A.3.6 outline the possible harmful effects of long-term use of anabolic steroids, EPO, beta blockers, caffeine and diuretics

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

Design – a flowchart to distinguish among training, overtraining, and overreaching, identifying examples of each

Research/Jigsaw – students research the various methods of training, identify examples of each and suggest a sport that would benefit from such

training (flexibility training, strength & resistance training, circuit training, interval training, plyometrics, continuous training, fartlek training, cross-training)

Discuss – possibly indicators of overtraining, identifying professional and personal examples and recommend using periodization to prevent it

Investigation – students conduct a number of experiments using hot/cold stimuli prior to completing physical tasks and gather data in order to analyze results and explain the body's physiological response to hot/cold environments and how the body thermoregulates

Research – the health risks associated with exercising in extreme temperatures (hot and cold)

Design – a training regimen to properly acclimatize

Research – the five classes of non-ergogenic aids banned by the IOC & WADA, discussing why they are banned, why athletes might be tempted to use them and the harmful effects of long-term use of them

Benchmark Assessments

A.1 Quiz

A.2 Quiz

A.3 Quiz

Unit A TEST (comprised of Paper 3 type questions)

STAGE 3- LEARNING PLAN

Instructional Map

Preview "I can" statements to identify learning objectives

Learn the components of training

Learn the factors that can contribute to successful training

(external: environment & internal: ergogenic aids) Apply knowledge

of training and influential factors to proposing an effective and

healthy training program 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)