

Public District School Board Writing Partnership

Health and Physical Education

Course Profile **Exercise Science**

Grade 12
University Preparation
PSE4U

• *for teachers by teachers*

This sample course of study was prepared for teachers to use in meeting local classroom needs, as appropriate. This is not a mandated approach to the teaching of the course. It may be used in its entirety, in part, or adapted.

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Acknowledgments

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Course Overview

Exercise Science, PSE4U, Grade 12, University Preparation

Policy Document: *The Ontario Curriculum, Grades 11 and 12, Health and Physical Education, 2000.*

Prerequisite: Any Grade 11 University or University/College Preparation course in Science,
or any Grade 11 or 12 Open course in Health and Physical Education

Course Description

This course focuses on the study of human movement and on the systems, factors, and principles involved in human development. Students will learn about the effects of physical activity on health and performance, the evolution of physical activity and sports, and the factors that influence an individual's participation in physical activity. The course prepares students for university programs in physical education, kinesiology, recreation, and sports administration.

Course Notes

The Ontario Curriculum, Grades 11 and 12, Health and Physical Education, 2000 focuses on healthy active living for all students. To incorporate this philosophy into a quality program, teachers need to address several key elements when planning learning opportunities:

1. **Key Learnings**

A quality health and physical education program directly links what is happening in the classroom to the curriculum expectations. This ensures that students are focused on what they are to know and what they are capable of doing. Clustering the overall and specific learning expectations into key learnings provides students with a framework and context for their learning. The following is a list of the key learnings for Grade 12 Exercise Science. By the end of the course, students will:

- describe the structure and function of the body and the physiological principles relating to human performance (Unit 1, 2);
- use biomechanical principles to analyse and improve movement (Unit 1, 2);
- demonstrate an understanding of the ways in which nutrition and training principles affect human performance (Unit 2);
- demonstrate an understanding of individual differences in performance, growth, and development (Unit 3);
- use the principles of motor learning to analyse or teach a skill (Unit 4);
- investigate the evolution of physical activity in sport (Unit 5);
- analyse the relationship of society and culture to sports and physical activity (Unit 5).

Throughout the course, teachers are encouraged to frame each lesson by identifying the learning expectations and connecting them to the key learnings.

2. **Destination Preparation**

The Exercise Science Grade 12 University Preparation course gives students the opportunity to study physical movement and to explore current sports issues and related health topics. It is designed to prepare students for university programs in physical education, kinesiology, recreation, sports administration, and health sciences. The course takes into consideration:

- What learning experiences will provide students with the appropriate knowledge and skills to be successful in the transition from secondary school to university?
- How much time should be spent between teacher-directed instruction and student-centred learning?

3. ***Making Learning Relevant***

A four-staged approach has been incorporated into this course to help students develop a solid knowledge base and understanding of the theories/concepts/principles, expand their perceptions and perspectives, and connect their learning to things that are relevant, authentic and of interest to them. Reference will be made to these stages in the Teaching/Learning Strategies of each activity section in this Course Profile.

Stage One: The Experience

Focuses on the question, “Why?” The teacher creates an experience that will encourage students to want to learn more. The experience relies on learners’ existing knowledge.

Stage Two: The Theory

Focuses on the question, “What?” The teacher provides information to link the experience with students’ existing knowledge base.

Stage Three: The Practice

Focuses on the question, “How?” Students practise the application of the theory in a personal situation or activity. Students practise and apply the defined givens.

Stage Four: The Extension Application

Focuses on the question, “If?” Students apply the theory to a new context. He/she extends the learning by delving deeper and wider to consider new possibilities.

Units: Titles and Time

* Unit 1	Anatomy and Physiology	29 hours
Unit 2	Human Performance	31 hours
Unit 3	Motor Development	25 hours
Unit 4	Evolution of Physical Activity and Sports	12.5 hours
Unit 5	Relationship of Society and Culture to Sports and Physical Activity	12.5 hours

* This unit is fully developed in this Course Profile.

Unit Overviews

Unit 1: Anatomy and Physiology

Time: 29 hours

Unit Description

Students explore the anatomy and physiology of the human body using correct anatomical terminology and physiological principles to describe human performance. They demonstrate an understanding of the skeletal and muscular systems and joint mechanics related to movement. Students analyse the relationship between the cardiorespiratory and energy systems as they relate to physical activity.

Unit Overview Chart

K/U = Knowledge/Understanding C = Communication T/I = Thinking/Inquiry A = Application

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation	Focus
1	BBV.01, C BB1.01, A BB1.02, C	- Formative self- and peer assessment of worksheets and glossary of terms on the use of anatomical terminology using an answer key checklist - Formative self assessment of worksheets on the parts of the skeletal and muscular systems checking for completion (Learning Skills - Work Habits) - Summative evaluation test (e.g., bell-ringer) demonstrating the use of anatomical terminology using a marking scheme	Use of anatomical terminology
2	BBV.01, C BB1.01, A BB1.02, C BB2.02, C BB1.03, C	- Formative peer assessment of worksheets on joint movement using an observation checklist - Summative evaluation of an oral or written assignment on the function of the skeletal and muscular systems and joint mechanics related to human movement using a marking scheme - Formative peer and teacher assessment of an oral presentation describing neuromuscular theories and principles (e.g., sliding filament theory, ATP, concentric, eccentric, and static contraction) using a checklist (used by the peer) and a communication rubric (used by the teacher)	Function of the muscular and skeletal system and joint mechanics
3	BBV.01, C BB1.05, A BB1.04, K/U BB1.06, C	- Formative peer assessment of a visual/graphic organizer describing the relationship between the cardio-respiratory system and the production of energy using a checklist -Formative assessment of a worksheet describing the energy systems and their contribution to muscular contraction and physical activity using a checklist - Summative evaluation of an oral presentation on a researched acute and chronic effect topic (e.g., increased cardiac output, VO2 Max) using a communication rubric	Cardio-respiratory system and energy system

Unit 2: Human Performance

Time: 31 hours

Unit Description

Students describe the relationship between nutrition and activity and investigate the effects of performance-enhancing methods and substances on human performance. Students demonstrate an understanding of the effects of training principles, technology, and environmental conditions on human performance. They use biomechanical principles to demonstrate an understanding related to improving movement.

Unit Overview Chart

K/U = Knowledge/Understanding C = Communication T/I = Thinking/Inquiry A = Application

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation	Focus
1	BB3.01, C BB3.02, T/I BBV.03, A BB3.01, C BB3.02, T/I	- Formative self and teacher assessment of a written or oral report describing the relationship between nutrition and physical activity (e.g., independent study, computer-assisted learning, visual presentation) using an observation checklist and/or communication rubric - Formative peer and teacher assessment of an oral presentation (e.g., carousel) investigating the effects of performance enhancing methods and substances on human performance using an observation checklist and a communication rubric - Summative evaluation of a written or oral analysis of the effects of nutrition, performance methods and substances on human performance using a marking scheme	Nutrition and performance enhancing methods/substances on human performance
2	BBV.03, A BB1.06, C BB1.07, T/I BB3.03, T/I MD2.03, C BB3.04, T/I	- Formative self, peer and teacher assessment of a written or oral lab report describing acute and chronic effects of physical activity on human performance using a checklist - Formative peer assessment of a worksheet analysing the effects of different environmental conditions on the body during physical activity using an observation checklist - Formative assessment of an oral presentation (e.g., carousel) evaluating the effects of various training methods and technology on human performance using a communication rubric - Summative evaluation of a written and or oral assignment on the application of training principles to adapt physical fitness and activity programs to address personal needs using a marking scheme	Training principles and technology affecting human performance
3	BBV.02, A BB2.01, C BB2.02, C BB2.03, A	- Formative self and peer assessment of a visual graphic organizer outlining/explaining the laws of physics as they relate to movement using a checklist - Summative evaluation of a written or oral assignment (e.g., visual worksheet circuit, illustrations, computer-assisted) describing the biomechanical principles and joint mechanics using a marking scheme - Summative evaluation test using a marking scheme to evaluate student's appropriate use of the laws of physics and biomechanical principles to analyse and improve human performance	Use of bio-mechanical principles related to improving movement

Unit 3: Motor Development

Time: 25 hours

Unit Description

Students demonstrate an understanding of the stages of development from infancy to adulthood to help them design an age-appropriate activity. They also demonstrate an understanding of the factors that affect physical growth and development. They investigate the physical and psychological factors that affect skill performance. Students demonstrate an understanding of motor learning such as the phases of motor development and the skill acquisition process, to analyse or teach a skill.

Unit Overview Chart

K/U = Knowledge/Understanding C = Communication T/I = Thinking/Inquiry A = Application

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation	Focus
1	MDV.01, A MD1.01, C MD1.02, A	- Formative assessment of written reports explaining the stages of development from infancy to adulthood and the factors that affect physical growth and development (e.g., seminar/tutorial, carousel, jigsaw) using a checklist - Summative evaluation of the creation of activities for different ages and stages of development (e.g., design project) using a marking scheme	Growth and development
2	MDV.02, A MD2.01, A MD2.02, C MD2.03, C MD2.04, A	- Formative peer assessment of written lab reports that apply knowledge of the phases of a skill to analyse movement using a checklist - Formative peer and teacher assessment of an oral or written lab report explaining the skill acquisition process using a checklist and a communication rubric - Formative self/peer/teacher assessment of a seminar tutorial describing the physical and psychological factors that affect skill performance using a checklist and a communication rubric - Summative evaluation of peer teaching that applies motor learning principles to analyse or teach a skill using a marking scheme	Principles of motor learning

Unit 4: Evolution of Physical Activity and Sports

Time: 12.5 hours

Unit Description

Students explore the world of sports and physical activity from a sociological perspective. Students demonstrate an understanding of the role of physical activity within the culture of sport and discover the evolution of sports through diverse time periods. They demonstrate an understanding of various sport-related issues, e.g., coaching, role modelling, violence in sport, exploitation in sport, equal access to sports. Students identify Canadian athletes and describe their contributions to the development of the current Canadian sport landscape.

Unit Overview Chart

K/U = Knowledge/Understanding C = Communication T/I = Thinking/Inquiry A = Application

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation	Focus
1	PA1.01, C PA1.02, K/U PA1.03, T/I PA2.06, K/U PAV.01, C	- Formative self/peer assessment of a visual table or web organizer to illustrate a historical timeline of physical activity and sports using an observation checklist - Formative self assessment of a table or visual organizer to demonstrate understanding of issues (e.g., violence in sports, cheating) related to sports and physical activity using a checklist - Formative self/teacher assessment of a mind map to analyse the factors that influence participation on physical activity and sports (e.g., current trends, coaching, role models) using an observation checklist - Formative peer assessment of a worksheet identifying Canadian athletes who have contributed to sports and physical activity, describing their contributions, using an answer key checklist - Summative evaluation of a researched written or oral presentation (e.g., seminar, tutorial) describing the evolution of physical activity and sport using a mark scheme and communication rubric	Timeline of historical development and participation influences Issues in sport and physical activity

Unit 5: Relationship of Society and Culture to Physical Activity and Sport

Time: 12.5 hours

Unit Description

Students demonstrate an understanding of the connections between society and culture as they influence and interact with the world of sport and physical activity. Students analyse relationships through such topics as business and sport, amateur versus professional sport, gender representation, and ethno-cultural preferences. Students describe the benefits of school and community physical activity and sports programs to themselves and to society.

Unit Overview Chart

K/U = Knowledge/Understanding C = Communication T/I = Thinking/Inquiry A = Application

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation	Focus
1	PAV.02, T/I PA2.01, T/I	- Formative self/peer assessment of written reports to analyse the relationships of business and sport/physical activity (e.g., sponsorship, amateur vs. professional) using an observation checklist	Sport as big business
	PA2.05, K/U	- Formative self-assessment of a worksheet to identify career opportunities in fields related to physical activity and sports using an observation checklist	
	PA2.02, C	- Formative assessment of an oral presentation explaining the importance of being an informed consumer with regards to sports and physical activity (e.g., oral carousel presentation) using a communication rubric	Societal and cultural factors that influence sport and physical activity
	PA2.03, C	- Formative assessment of worksheets describing societal and cultural factors (e.g., gender representation, ethno-cultural preferences) that influence sports and physical activity programs using a checklist	
	PA2.04, C	- Formative peer assessment of a written or oral presentation describing the benefits (e.g., increase fitness participation) of school and community physical activity and sports programs for themselves and for society using an observation checklist	
	PAV.02, T/I	- Summative evaluation of a written report using an interview process to analyse the relationship of society and culture to sports and physical activity using a marking scheme	

Teaching/Learning Strategies

Students learn best when they are active, exploring, questioning/searching for meaning, investigating/experimenting, looking for connections/relationships/patterns, sharing/discussing with others and reflecting. Consider how students learn, the optimal conditions for learning and the learning skills needed to develop an effective program that focuses on improved student learning.

1. Improved student learning is enhanced when we understand how students learn. Take into consideration developmental stages, brain/mind (or brain-compatible) learning, learning preferences, learning styles, and learning environment.
2. Create conditions for optimal learning by considering the full range of teaching and learning strategies. Teaching and learning strategies are instructional practices that:
 - involve a sequence of steps or a number of related concepts;
 - determine the approach a teacher may take to achieve learning objectives and meet diverse learner needs;
 - should be selected based on an understanding of how students learn.

The teaching and learning strategies can be categorized under four headings as identified below:

Direct Instruction

Lecture – an oral presentation of facts or principles during which the learner is responsible for taking appropriate notes

Demonstrations/modelling – performing a skill or activity in order to show how to do it

Didactic Questions – guiding students to predetermined learning through the use of lower order questions

Drill and Practice – repetition of fundamental skills to enhance speed and accuracy of performance

Guides for Reading, Listening, and Viewing – structured formats intended to direct students to appropriate learning expectations in reading, listening, or viewing

Indirect Instruction

Inquiry – an organized process for investigating a significant question

Problem Solving – an organized process for solving a problem

Research – gathering and interpreting data on a specific topic

Case Studies – investigation of a specific event, situation, or person to develop an understanding of factors that can be generalized to other situations

Concept Formation – an inductive thinking strategy in which students sort, classify, and/or group items, ideas, opinions, into categories to draw inferences, make generalizations, and develop concepts

Concept Attainment – clarifying a concept by providing positive and negative examples of that concept

Reflection – process of thinking about and connecting ideas, experiences, and learnings

Debate – the presentation of opposing sides of an issue by two teams/individuals before an audience or judge

Interactive Instruction

Cooperative Learning – a variety of interdependent learning structures where students learn in small heterogeneous groups

- *Jigsaw* – Students are divided into “home” groups. Each student in the group moves into a different expert group to gather information (provided by the teacher or through research) and then goes back to the home group to share that information
- *Think/Pair/Share* – Students begin thinking about a concept on their own, then work with a partner to share and discuss ideas
- *Snowballing* – pairs of students begin sharing ideas. After a few minutes, the pairs join with another pair to form a group of four to share ideas. The groups continue to combine to form groups of eight, then 16. New ideas are added and discussed
- *Numbered Heads* – Numbered heads is a structure whereby students number off, e.g., four in a group, and the teacher poses a problem and sets a time limit for each group to investigate. The teacher calls a number and the student with that number in each group responds.

Learning Circles – small groups of students who discuss a common test, topic, or problem in order to deepen understanding

Brainstorming – a group activity in which participants are encouraged to think uncritically about all possible ideas, approaches, or solutions

Role Playing – assuming the role of another and acting out a situation to develop understanding and insights

Peer Coaching – a structured situation where students teach and learn from each other

Experiential Learning – a situation requiring a high level of active involvement in his/her own learning that is inductive, learner centred and activity oriented. These activities may include field trips, simulations, model building, analysing, drawing inferences or conclusions, providing reasons and evidence for conclusions, or reflecting on experiences in analysing, inferring, decision-making, and conclusions.

Independent Instruction

Independent Project – a formal assignment on a topic related to the curriculum

Learning Centres – a specially organized space containing specific resources and/or equipment

Learning Contracts – a plan of instruction allowing students to proceed at their own rate in learning specified material

Many of the learning expectations in this course focus on students' ability to communicate their understanding of concepts/principles and their use of higher-thinking skills. Indirect and interactive instruction strategies have been used widely throughout the Course Profile to provide students with multiple opportunities to learn and practise before they are required to demonstrate the learning.

Access the Ministry of Education Electronic *Curriculum Unit Planner* for a complete collection of Teaching/Learning Strategies.

3. Help students develop effective learning skills.

Consider:

- the skills and knowledge required to participate in learning, e.g., working independently, self-assessment, setting goals and monitoring progress, adapting to change, inquiry skills;
- the self-knowledge, personal and interpersonal skills to interact positively with others, e.g., self-management, getting along with others, social responsibility;
- the skills and knowledge required to plan their present and future lives and to determine the learning required to implement the plan, e.g., self-assessment, exploring and obtaining information, awareness of opportunities.

Assessment & Evaluation of Student Achievement

The process of moving from *The Ontario Curriculum, Grades 11 and 12, Health and Physical Education, 2000* to completing the Provincial Report Card involves a number of steps:

Step #1 - connecting the learning expectations and Achievement Chart categories to clarify the expected student learning

Step #2 - gathering evidence of student learning relevant to the expected learning in the curriculum

Step #3 - recording evidence of student learning

Step #4 - making a judgement based on recorded evidence of student learning

Step #5 - reporting student achievement

This Course Profile focuses on the first two steps. The following outlines the key components of these two steps.

Step #1: Connecting Learning Expectations to the Achievement Chart

The learning expectations in the curriculum are the *content standards* and identify what students need to know and what they are capable of doing. The Achievement Chart identifies the *performance standards* and describes how well students have achieved the curriculum expectations. The verbs in each of the learning expectations have been used to link the *content* and the *performance standards*.

The following are examples of verbs used in the expectations organized by category, found in *The Ontario Curriculum, Grades 11 and 12, Health and Physical Education, 2000* document:

- Knowledge/Understanding (identify, demonstrate an understanding, define)
- Thinking/Inquiry (assess, analyse, evaluate, design, adapt)
- Communication (explain, describe, communicate)
- Application (demonstrate, apply, use, participate, maintain, improve)

See the Unit Overview Charts in the Course Overview for the connection of learning expectations to the Achievement Chart (e.g., MDV.01, Application, BB3.04 Thinking/Inquiry, PA1.01 Communication, PA2.06 Knowledge/Understanding).

By examining the Achievement Chart, teachers can focus on the significant aspects of learning they should be assessing. Is the learning expectation asking students to demonstrate Knowledge/Understanding, Thinking/Inquiry skills, Application, Communication, or a combination of these categories? Using this as the starting point, the teacher can work with students to determine the specific criteria and performance indicators for the demonstration of learning. Students are more successful when teachers provide clear targets so they know exactly what they are to demonstrate.

Step #2: Gathering Evidence of Student Learning

Once the targets are clear, it is also easier for teachers to determine:

- how much evidence they will need to assess and evaluate students;
- the best methods of assessment and evaluation, e.g., paper pencil, performance task, personal communication, to provide students with opportunities to learn and practise before being expected to demonstrate the learning;
- the best assessment tools, e.g., rubric, checklist, marking scheme, rating scale, to collect the appropriate evidence of students' learning;
- how to involve students (self-assessment, peer assessment) in the assessment process to improve their learning and manage the task of gathering evidence.

Clarifying the Assessment Language and Writing Format

Certain assessment terms have been used and processes identified in the Overview Charts and assessment sections of the Course Profile. The following provides a brief explanation of how the charts are organized and how the terms have been used:

The Unit Overview Charts identify:

- all of the learning expectations and the related Achievement Chart categories;
- the type of assessment or evaluation, e.g., diagnostic, formative or summative;
- the assessor or evaluator, e.g., student, peer, teacher;
- the assessment strategies, e.g., pencil-and-paper strategies, performance task strategies, personal communication strategies;
- the assessment tool e.g., rubric, checklist, marking scheme, rating scale, anecdotal comments;
- the focus of the assessment in relationship to the key learnings (see PSE4U Overview, Course Notes page 1 for key learnings).

In Unit 1, the Assessment and Evaluation of Student Achievement section identifies:

- the type of assessment or evaluation, e.g., diagnostic, formative or summative;
- the assessor or evaluator, e.g., student, peer, teacher;
- the assessment strategy, e.g., paper-pencil strategies, performance task strategies, personal communication strategies;
- the assessment tool, e.g., rubric, checklist, marking scheme, rating scale, anecdotal comments;
- the focus of the assessment in relationship to the learning expectations;
- the learning expectations (in brackets) being assessed or evaluated.

Assessment is the gathering of information about the progress or achievement of a student or group of students, using a variety of strategies/tool. This is an act of describing student performance for the purpose of enhancing learning.

It can be compared to coaching. It is the helpful, meaningful feedback provided to student to assist them in doing their very best. Assessment is never used to calculate a student’s grade, but can be taken into consideration if you need to confirm an evaluation. Students should recognize assessment as the safe time to take risks to learn and practise before they are expected to demonstrate their learning.

Evaluation is the process of judging and putting a value, e.g., mark, level, on the quality of student achievement against the performance standards. Evaluation is recorded in the teacher’s mark book. The teacher should evaluate the demonstration of the synthesized learning after students have had plenty of opportunity to learn and practise.

Assessment and evaluation are ongoing and serve different purposes at different times.

	<i>Diagnostic Assessment</i>	<i>Formative</i>		<i>Summative Evaluation</i>
		<i>Assessment</i>	<i>Evaluation</i>	
What?	- assessing what students know and are able to demonstrate prior to instruction	- assessing what students know and are able to do as they progress through the learning and practice opportunities	- evaluating what students know and are able to do at certain points during the process of learning and practising	- evaluating students’ demonstration of what they know and are able to do at the end of the instruction
When?	- occurs before instruction begins	- is ongoing as students learn and practise	- occurs at one or more checkpoints throughout the process of learning and practising	- occurs at the end of the instructional unit, e.g., unit, course, and will not be judged again in the course
Why?	- helps determine starting points and helps the teacher program appropriately for individual students	- provides ongoing meaningful feedback to help students improve as the learning/ practice builds, becomes more complex and connects with other learning	- provides a snapshot of students’ achievement, e.g., mark, level at specific points in the course before the final demonstration (summative evaluation)	- provides students with the opportunity to synthesize knowledge and skills and demonstrate their achievement

		<i>Formative</i>		
How?	- assessment strategies to provide a holistic picture of the learning students have acquired in the past	- assessment strategies to provide opportunities for students to learn and practise	- strategies that are relevant to: a) the expected learning; b) the point students have progressed to in the learning process; c) the summative evaluation (demonstration) planned for the end of the instructional unit.	- strategies that: a) require students to synthesize and apply the key learnings; b) require students to demonstrate learning in new or unfamiliar context (but not new learning); c) present students with engaging, challenging problems; d) allow for individual student accountability.
Note	- information from diagnostic assessments must not count towards the final grade	- formative assessment may be taken into consideration in determining students' final grades	- formative evaluation may count towards students' final grades	- summative evaluation will always count towards students' final grades

There are three assessment methods:

- Pencil-and-paper, e.g., quiz, test, written examination
- Performance task, e.g., skill demonstration, role play, video tape
- Personal communication, e.g., student teacher conference, oral examination

Under each of these categories, there are various types of assessment strategies. Some examples have been listed above beside each assessment method.

One of the critical professional judgments teachers must make is to appropriately match the assessment strategy(ies) to the type(s) of learning being assessed. There are a wide variety of assessment strategies available to teachers. Assessment strategies are what the teacher will have the students doing to demonstrate their learning.

Assessment tools that may be used by the teacher and students, e.g., self- and peer assessment, to gather evidence of learning include: marking scheme, rating scale, checklist, and rubric. Teachers should choose assessment tools appropriate to the assessment task, e.g., a rubric for performance task strategies, marking scheme for paper pencil strategies.

The Final Grade

The Ontario Curriculum, Grades 11 and 12, Program Planning and Assessment document states:

The final grade for each course will be determined as follows:

- Seventy per cent of the grade will be based on assessments and evaluations conducted throughout the course.
- Thirty per cent of the grade will be based on a final evaluation in the form of an examination, performance, essay, and/or other method of evaluation suitable to the course content and administered towards the end of the course.

The final 30% summative evaluation should reflect many of the key learnings of the course and the weighting of the Achievement Chart categories in relationship to the key learnings addressed. Teachers may use a variety of methods to determine the 30% evaluation for the final grade. The following is suggested for this course.

- A written examination
- A portfolio: a collection of student work, e.g., case study analysis, computer animation designs, ergonomic project, adapting equipment for the needs of special populations or future technology from three main focus areas:
 - Human Performance, e.g., nutrition, physiological principles, training principles, biomechanics
 - Motor Development, e.g., growth and development and motor learning
 - Physical Activity and Sport in Society and Culture

The portfolio may be used as the foundation of evidence for a student-led conference or written reflection/response to demonstrate the key learnings.

Accommodations

Accommodations have been identified in the Unit Overview of Unit 1 to specifically address the activities. Teachers are encouraged to access the Special Education Companion from the Ministry of Education Electronic *Curriculum Unit Planner* for additional suggestions. The teacher should consult individual student IEPs (Individual Education Plans) for specific direction on accommodation for individuals.

Resources

Units in this profile make reference to the use of specific texts, magazines, films, and videos. Before reproducing materials for student use from books and magazines, teachers need to ensure that their board has a Cancopy licence and that this licence covers resources they wish to use. Before screening videos for their students, teachers need to ensure that their board/school has obtained the appropriate public performance videocassette licence from an authorized distributor, e.g., Audio Cine Films Inc. Teachers are also reminded that much of the material on the Internet is protected by copyright. The person or organization that created the work usually owns that copyright. Reproduction of any work or a substantial part of any work on the Internet is not allowed without the permission of the owner.

The URLs for the websites were verified by the writers prior to publication. Given the frequency with which these designations change, teachers should always verify the websites prior to assigning them for student use.

Amos, Sue and Susan Orchard. *Health and Physical Education, Grade 9-10, Plan, Assess and Report*.

Barrie: Data Based Directions, 2001 ISBN 1-894369-16-5

Canadian Association for Health, Physical Education, Recreation and Dance. *Moving to Inclusion*. CAHPERD, 403-2197 Riverside Drive, Ottawa, K1H 7X3 – www.cahperd.ca (for many health and physical education resources)

Course Profile, Grade 9, Public Healthy Active Living Education, Open.

Course Profile, Grade 10, Public Healthy Active Living Education, Open.

Course Profile, Grade 11, Public Healthy Active Living Education, Open.

Course Profile, Grade 11, Public Health for Life, Open.

Halton District School Board. *Guidelines for Assessment and Evaluation of Student Achievement, Principles and Standards for Effective Practice*. 1999

Harper, M., K. O'Connor, and M. Simpson. *Quality Assessment: Fitting the Pieces Together*. Toronto: Ontario Secondary School Teachers Federation, July 1998. ISBN 0-920930-47-6

Ontario Physical and Health Education Association. *Ontario Health and Physical Education Support: Grades 9 and 10*. Toronto: OPHEA, 2000.

Ontario Physical and Health Education Association. – www.ophea.net

The Physician and Sportsmedicine Online 2002. The McGraw-Hill Companies

– <http://www.physsportsmed.com/>

Robertson, Tricia and Sara Glover. *Senior Physical Education: Revised Edition*. Australia: Coghill Publishing, 1990 ISBN 949168718

Coded Expectations, Exercise Science, Grade 12, University Preparation, PSE4U

The Biological Basis of Movement

Overall Expectations

- BBV.01** · describe the structure and function of the body and of physiological principles relating to human performance;
- BBV.02** · demonstrate an understanding of biomechanical principles related to improving movement;
- BBV.03** · demonstrate an understanding of the ways in which nutrition and training principles affect human performance.

Specific Expectations

Anatomy and Physiology

- BB1.01** – use correct anatomical terminology when describing human performance;
- BB1.02** – describe the various parts of the skeletal and muscular systems, and the ways in which they relate to human performance (e.g., according to their location, structure, function, and characteristics);
- BB1.03** – describe muscle contraction, demonstrating their understanding of sliding filament theory, the use of adenosine triphosphate (ATP) and calcium, excitation/coupling contraction theory, and concentric, eccentric, and static contractions;
- BB1.04** – demonstrate an understanding of the energy systems (e.g., ATP/PC, anaerobic and aerobic systems) and their contribution to muscular contraction and activity (e.g., as in long-distance running as compared to sprinting);
- BB1.05** – demonstrate an understanding of the relationship between the cardiorespiratory system and the production of energy (e.g., the transporting of nutrients and oxygen to the working muscles);
- BB1.06** – describe the acute and chronic effects of physical activity on the body (e.g., increased cardiac output, increased endorphin levels, increased muscular strength and endurance);
- BB1.07** – analyse the effects of different environmental conditions (e.g., altitude, climate, air quality) on the body during activity.

Biomechanics

- BB2.01** – explain the laws of physics as they relate to movement (e.g., Newton’s laws related to levers, velocity, and linear acceleration);
- BB2.02** – describe the biomechanical principles (e.g., stability, the relationship between force and movement, angular motion) and joint mechanics (e.g., types of joints, range of motion);
- BB2.03** – use the appropriate laws of physics and biomechanical principles to analyse human performance (e.g., in running or jumping).

Human Performance

- BB3.01** – describe the relationship between nutrition and activity (e.g., caloric balance, nutrient balance, hydration, needs of specific populations);
- BB3.02** – analyse the effects of performance-enhancing methods and substances (e.g., drugs, alcohol, nutritional and herbal supplements, steroids, blood doping) on human performance;
- BB3.03** – evaluate the effects of various training methods on performance (e.g., effects of sports- or activity-specific and nonspecific training, effects of overtraining);
- BB3.04** – adapt physical fitness and activity programs to address personal needs.

Motor Development

Overall Expectations

- MDV.01** · demonstrate an understanding of individual differences in performance, growth, and development;
- MDV.02** · demonstrate an understanding of the principles of motor learning.

Specific Expectations

Growth and Development

- MD1.01** – explain the stages of development from infancy to adulthood and the factors that affect physical growth and development;
- MD1.02** – demonstrate an ability to design activities appropriate for different ages and stages of development.

Motor Learning

- MD2.01** – apply knowledge of the phases of a skill (e.g., the phases of a golf stroke: preliminary movement, backswing and recovery, force-producing movement, critical instant, follow-through) to analyse movement;
- MD2.02** – explain skill acquisition processes (e.g., the stages of learning, the role of feedback, transferability);
- MD2.03** – describe the physical and psychological factors that affect skill performance (e.g., fatigue, visualization, audience, motivation);
- MD2.04** – apply motor-learning principles to analyse or teach a skill.

Physical Activity and Sports in Society

Overall Expectations

- PAV.01** · describe the evolution of physical activity and sports;
- PAV.02** · analyse the relationship of society and culture to sports and physical activity.

Specific Expectations

Physical Activity and Sports Issues

- PA1.01** – describe the historical development of physical activity and sports;
- PA1.02** – identify issues in society related to sports and physical activity (e.g., violence in sports, exploitation in sports, cheating in sports, equal access to sports, physical activity trends);
- PA1.03** – analyse the factors that influence participation in physical activity and sports (e.g., current trends, coaching, role models, personal perception of physical activity).

Society and Culture

- PA2.01** – analyse the relationship between business and sports and physical activity (e.g., compare an amateur sport to a professional sport, explore the nature of sponsorship);
- PA2.02** – explain the importance of being an informed consumer with regard to sports and physical activity;
- PA2.03** – describe societal and cultural factors (e.g., gender representation, ethno-cultural preferences) that influence sports and physical activity programs;
- PA2.04** – describe the benefits of school and community physical activity and sports programs for themselves and for society (e.g., increased fitness and participation, better school spirit);
- PA2.05** – identify career opportunities in fields related to physical activity and sports;
- PA2.06** – identify Canadian athletes who have contributed to sports and physical activity and describe their contributions.

Unit 1: Anatomy and Physiology

Time: 29 hours

Unit Description

Students explore the anatomy and physiology of the human body using correct anatomical terminology and physiological principles to describe human performance. They demonstrate an understanding of the skeletal and muscular systems and joint mechanics related to movement. Students analyse the relationship of the cardiorespiratory and energy systems as they relate to physical activity.

Strand(s) & Learning Expectations

Strand(s): Biological Basis of Movement

Unit Synopsis Chart

Activity	Learning Expectations Achievement Categories	Assessment/Evaluation
1	BBV.01, C BB1.01, A BB1.02, C	- Formative self-and peer assessment of worksheets and glossary of terms on the use of anatomical terminology using an answer key checklist - Formative self-assessment of worksheets on the parts of the skeletal and muscular systems through checking for completion - Summative evaluation test (e.g., bell-ringer) demonstrating the use of anatomical terminology using a marking scheme
2	BBV.01, C BB1.01, A BB1.02, C BB2.02, C BB1.03, C	- Formative peer assessment of worksheets on joint movement using an observation checklist - Summative evaluation of an oral or written assignment on the function of the skeletal and muscular systems and joint mechanics related to human movement using a marking scheme - Formative peer and teacher assessment of an oral presentation describing neuromuscular theories and principles (e.g., sliding filament theory, ATP, concentric, eccentric, and static contraction) using a checklist (used by the peer) and a communication rubric (used by the teacher)
3	BBV.01, C BB1.05, A BB1.04, K/U BB1.06, C	- Formative peer assessment of a visual/graphic organizer describing the relationship between the cardiorespiratory system and the production of energy using a checklist - Formative assessment of a worksheet describing the energy systems and their contribution to muscular contraction and physical activity using a checklist - Summative evaluation of an oral presentation on a researched acute and chronic effect topic (e.g., increased cardiac output, VO ₂ Max) using a communication rubric

Activities: Titles and Times

Activity 1	Anatomical Terminology	8 hours
Activity 2	Function of Muscular and Skeletal Systems	10 hours
Activity 3	Moving Through the Body: Cardiorespiratory System and Energy Production	11 hours

Unit Planning Notes

This unit provides students with opportunities to acquire and discuss information related to anatomy and physiology. Due to the nature of these topics, some students may find resource materials upsetting. Teachers should caution and guide students in selecting, sharing, and/or exploring information/media appropriate to the activity. Teachers are encouraged to read/preview resources carefully to ensure information is appropriately presented, accurate, and up-to-date.

Teachers should frame each lesson by identifying the learning expectations and connecting and clarifying the assessment/evaluation strategies to ensure students have clear targets to work towards throughout the unit.

Prior Knowledge & Skills

To successfully accomplish the activities in this unit, students should have:

- knowledge and skills related to topics as identified in the curriculum of previous grades;
- group work skills, e.g., jigsaw, carousel, numbered heads;
- lab skills;
- note-taking skills;
- library/resource centre and Internet research skills;
- the ability to use a variety of assessment tools, e.g., rubric, checklist, for self- and peer assessment;
- debating skills and oral presentation skills.

Teaching/Learning Strategies

The unit provides students with opportunities to think, communicate, interact, and apply their knowledge with respect to the use of anatomical terminology and physiological principles when describing human performance. The four-staged approach, i.e., The Experience, The Theory, The Practice, The Extension Application, has been incorporated to help students develop a solid knowledge base and understanding of the theories/concepts/principles, expand their perceptions and perspectives, and connect their learning to things that are relevant, authentic and of interest to them. A wide variety of teaching/learning strategies have been used in conjunction with the stages, i.e., direct instruction, indirect instruction, interactive instruction, and independent instruction, to address the learning needs of all students.

Assessment & Evaluation of Student Achievement

This unit provides students with the opportunity to acquire and discuss information related to anatomy and physiology. Communication skills are formatively assessed throughout the unit when using anatomical terminology and physiological principles to analyse movement. A variety of assessment methods and strategies that address individual needs and different learning styles of students are used, including: pencil-and-paper (test, visual/graphic organizer, glossary of terms), performance tasks (assignments, labs) and personal communication (oral presentation, instructional questions and answers, classroom discussion). The teacher and students use the following assessment tools: observation checklist, answer key checklist, rubric, and marking scheme. Ongoing assessment and evaluation provide students with the opportunity to learn, practise, and demonstrate their knowledge and skills.

Accommodations

Consider the following accommodations, when appropriate, to address the needs of students.

- Provide a visual outline of lessons on the board, overhead, or handout.
- Provide key visuals or graphic organizers for assignments as an alternative.
- Partner students to work with appropriate people or resources.
- Provide key vocabulary or reference notes.
- Assist students to recall prior knowledge before introducing new information.
- Use appropriate visual materials rather than print material to convey information.

Access the Special Education Companion from the Ministry of Education electronic *Curriculum Unit Planner* for additional suggestions to ensure the success of exceptional students. Teachers should also refer to the exceptional students' IEPs to ensure that recommendations are followed.

Resources

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Baechle, T. R. and R.W. Earle. *Essentials of Strength Training and Conditioning*. Windsor: Human Kinetics, 2000. ISBN 0-7360-0089-5

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Kapit, W. and L.M. Elson. *The Anatomy Colouring Book*, 3rd ed. Toronto: Benjamin Cummings, 2001. ISBN 0-8053-5086-1

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– <http://www.physsportsmed.com/>

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University of Michigan. Joint Movements.
– <http://www.med.umich.edu/lrc/Hypermuscle/Hyper.html#flex>

University of California at San Diego.2000.
– <http://www-neuromus.ucsd.edu/MusIntro/Jump.html>

Activity 1: Anatomical Terminology

Time: 8 hours

Description

Students use correct anatomical terminology such as anatomical position, anatomical planes, axes, terms of direction and movement, and regions of the body. Students identify skeletal and muscular location.

Strand(s) & Learning Expectations

Strand(s): Biological Basis of Movement

Overall Expectations

BBV.01 - describe the structure and function of the body and of physiological principles relating to human performance.

Specific Expectations

BB1.01 - use correct anatomical terminology when describing human performance;

BB1.02 - describe the various parts of the skeletal and muscular systems, and the ways in which they relate to human performance (e.g., according to their location, structure, function and characteristics).

Planning Notes

The teacher should consider the following preparation for the delivery of this activity:

- provide task-cards for various movements, e.g., hip-flexion, arm-extension or provide a list of movements, e.g., skipping, throwing a ball, picking up a book;
- provide a variety of worksheets, e.g., to use anatomical terms, to colour, to label, to describe movement within plane and prepare lecture notes on anatomical terminology;
- prepare correct answer key sheets for anatomical terminology worksheets;
- provide a list of movements, e.g., stride jumps, nodding yes or no, to describe planes and axes activity and prepare an answer key sheet;
- provide worksheets and prepare lecture notes on the parts of the skeletal and muscular systems;

- provide x-rays, e.g., ankle joint, knee joint, or skeletal model(s), e.g., three-dimensional models, or “skeletal manipulation lab” or worksheet on layperson terms vs. anatomical terminology;
- provide “muscular system lab” or weight room circuit with worksheet identifying muscles being used;
- prepare a written test on anatomical terminology and a provide marking scheme.

Prior Knowledge & Skills

To successfully accomplish the activities in this unit, students should have:

- knowledge and skills related to topics as identified in the curriculum of previous grades;
- group work skills, e.g., numbered heads;
- lab skills;
- note-taking skills;
- library/resource centre and Internet research skills;
- ability to use a variety of assessment tools, e.g., rubric, checklist, for self-and peer assessment.

Teaching/Learning Strategies

1. Students reflect on using anatomical terminology as it relates to human movement. Create an experience that will encourage students to want to learn more by engaging them in one or more of the following activities.

Students name and identify the muscles that are used within the movement.

- a) In groups of four, students use their own words to describe the movement that the teacher or a student performs, e.g., stand with your hands on your shoulders, stand in a stork-stand.

OR

- b) Students perform various movements described on task-cards, e.g., hip-flexion, arm-extension.

OR

- c) Provide a list of movements, e.g., skipping, throwing, bicep curl, and picking up a book, that students choose to look at and/or perform.

Teacher and students discuss the importance of anatomical terminology, e.g., universal consistency when describing movement.

2. Provide students with information, e.g., lecture, computer-assisted, video, and handouts, on anatomical terminology. Information should include:

- anatomical position, i.e., palms facing forward, feet together, looking forward;
- anatomical planes, e.g., frontal, horizontal, and axes (anteroposterior);
- terms of direction, e.g., superior, inferior;
- terms of movement, e.g., flexion, extension;
- regions of the body, e.g., neck, trunk.

The information presented links to the experiential learnings conducted by the students at the beginning of this activity.

3. As a homework assignment, students complete worksheets on anatomical terminology, e.g., label, colour, match, identify. Provide students with correct answer key sheets.
4. In a numbered-head format put students in groups of four, five, or six and have them number off within the group. Each group receives a list of movements, e.g., stride jumps, cartwheel, nodding yes or no and is asked to describe movement within each plane and axis, e.g., frontal, anteroposterior. Students may perform the movements for understanding. During the activity, ask students by number to respond with the group’s findings, e.g., orally or written. Answers given should lead into a class discussion on the type of movement that is allowed within planes and axes. During the class discussion, students check their findings for correctness.

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5. Using a lecture format and providing resources, e.g., visual stimuli, handouts, video, glossaries, textbooks and computer software, students complete worksheets, e.g., diagrams, colouring, and fill in the blanks, on the parts of the skeletal systems, e.g., types and names of bones, bone landmarks. Use visual aids to show correct anatomical names.
 6. In pairs, students locate parts and structures of the skeletal system, e.g., axial vs. appendicular, ulna vs. radius, through one of the following activities:
 - a) Students examine the model of a skeleton or x-rays to complete worksheets,
 - OR
 - b) Students complete a “Skeletal Manipulation Lab.”
 - OR
 - c) Students complete a worksheet that compares common terms versus anatomical terms, e.g., thigh bone versus femur, skull versus cranium.
 7. Using a lecture format and providing resources, e.g., visual stimuli, handouts, video, glossaries, textbooks and computer software, students complete worksheets, e.g., diagrams, colouring, fill in the blanks, on the parts of the muscular systems, e.g., types and names of muscles, muscle groups, muscle location and muscle origin and insertion. Use visual aids to show correct anatomical terminology
 8. In groups of two to four, students identify the major muscles and/or muscle groups used during movement through one of the following activities:
 - a) Students complete a “Muscular System Lab,” e.g., palpating or identifying muscles on self or partner)
 - OR
 - b) Students do exercises, e.g., circuit, in a weight room setting and complete provided worksheet to identify the muscle(s) being used
 9. Students begin an ongoing “glossary of terms” for all new terminology in this unit.
 10. Students write a test, e.g., bell ringer, on the use of anatomical terminology for evaluation by the teacher.

Assessment & Evaluation of Student Achievement

The teacher and students gather evidence of learning expectations outlined for this activity through:

- a formative self- and peer assessment of worksheets and glossary of terms on the use of anatomical terminology using an answer key checklist (BBV.01);
- a formative self-assessment of worksheets on the parts of the skeletal and muscular systems checking for completion (BB1.01, BB1.02);
- a summative evaluation test, e.g., bell-ringer, demonstrating the use of anatomical terminology using a marking scheme (BB1. 01, BB1.02).

Resources

Anatomy Practice: Interactive Physiology. A.D.A.M. Software Inc., 1997. Toronto: Benjamin Cummings – www.adam.com

Baechle, T.R. and R.W. Earle. *Essentials of Strength Training and Conditioning*. Windsor: Human Kinetics, 2000. ISBN 0-7360-0089-5

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University of Michigan. Joint Movements
– <http://www.med.umich.edu/lrc/Hypermuscle/Hyper.html#flex>

Activity 2: Function of Muscular and Skeletal Systems

Time: 10 hours

Description

Students describe the function of the muscular and skeletal systems as they relate to body direction, e.g., adduction, abduction, elevation, depression, and joint movement. Students investigate neuromuscular concepts such as the sliding filament theory, the motor unit and the basic function of the nerve, as they relate to muscular movement. Students explore the relationship between the skeletal and muscular systems of the body as they relate to human movement.

Strand(s) & Learning Expectations

Strand(s): The Biological Basis of Movement

Overall Expectations

BBV.01 - describe the structure and function of the body and of physiological principles relating to human performance.

Specific Expectations

BB1.01 - use correct anatomical terminology when describing human performance;

BB1.02 - describe the various parts of the skeletal and muscular systems, and the ways in which they relate to human performance (e.g., according to their location, structure, function and characteristics);

BB2.02 - describe the biomechanical principles (e.g., stability, the relationship between force and movement, angular motion) and joint mechanics (e.g., types of joints, range of motion);

BB1.03 - describe muscular contraction, demonstrating their understanding of sliding filament theory, the use of adenosine triphosphate (ATP) and calcium, excitation/coupling contraction theory, and concentric, eccentric, and static contractions.

Planning Notes

The teacher should consider the following preparations for the delivery of this activity.

- Consult with the library/resource centre staff and/or computer staff and book class time to allow for independent student research.
- Provide a video on joint vulnerability or materials to construct a joint.
- Provide worksheets, e.g., diagram, fill in the blanks, and prepare lecture notes on the function of the skeletal system and joint mechanics.
- Provide a worksheet and various media, e.g., task cards, models, computer software, for joint movement activity.
- Prepare an answer sheet for joint movement activity.
- Provide worksheets and prepare lecture notes on the characteristics of skeletal muscle.
- Provide a worksheet for the “movement lab” and prepare materials, e.g., surgical tubing, dyna-bands for the static lab or book school weight room for the dynamic lab.
- Provide resources and worksheets on the neuromuscular theories and principles activity.
- Prepare a completion checklist and a communication rubric to assess an oral presentation on neuromuscular theory and principles.
- Prepare a marking scheme for the function of the skeletal and muscular systems and joint mechanics assignment.

Prior Knowledge & Skills

To successfully accomplish the activities in this unit, students should have:

- group work skills, e.g., think/pair/share;
- lab skills;
- note-taking skills;
- library/resource centre and Internet research skills;
- the ability to use a variety of assessment tools, e.g., rubric, checklist, for self- and peer assessment;
- oral presentation skills;
- interview skills.

Teaching/Learning Strategies

1. Through one of the following experiential activities, students reflect upon the complexity of the skeletal and muscular systems:
 - a) As a class, students view a video detailing the vulnerability of a body joint, e.g., arthroscopic surgery, sporting injuries.

OR

- b) In pairs, using various materials, e.g., interlocking construction blocks, wooden sticks, elastics, students construct a joint.

Following the activity, pairs of students brainstorm to draw conclusions of the complexity, e.g., joint stability, range of motion, and function, of the skeletal and muscular systems related to joint movement. Through class discussion students generate a list of their findings.

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2. Referring to the findings from the experiential activity and using a variety of resources, e.g., video, Internet, textbooks, provide information on:
 - a) the function of the skeletal system, e.g., framework, organ protection, muscle attachment;
 - b) joint classification, e.g., suture, synovial;
 - c) joint characteristics, e.g., joint capsule, ligaments, tendons, cartilage;
 - d) joint articulation, e.g., biaxial, multi-axial.

Students take notes and complete worksheets, e.g., fill in the blank, colouring book, diagrams, charts. Students check for correctness using visual aids that show anatomical terminology.

3. In pairs, students move from station to station looking at various media (e.g., task cards, models, computer software, video, slides) illustrating various joints (e.g., skull, jaw, teeth, elbow, knee) to complete a worksheet that requires the following information:
 - a) joint classification
 - b) articulation
 - c) bones involved

After students have completed all stations, a student from each station and in sequential order, reads out the correct answer posted at each station. Students check each other's worksheets for correctness.

4. Provide students with a list of acute and chronic injuries, e.g., sprains, pulls, dislocation, tendonitis that occur at various joints during physical activity. In a think/pair/share format, provide students with one sport and one activity, e.g., football and in-line skating. Ask them to individually consider common injuries that could occur in that sport or activity. In pairs, students compare their findings then share with the class. Class discussion could include factors, e.g., gender, equipment, playing surfaces, that influence specific injuries to specific joints.
5. Using a lecture format with the assistance of various aids, e.g., visual stimuli, handouts, video, glossaries, textbooks and computer software, students take notes and complete worksheets (e.g., diagrams, colouring, fill in the blanks) on the characteristics of skeletal muscles:
 - a) agonist and antagonist, e.g., biceps/triceps, hamstrings/quadriceps;
 - b) types of contraction, e.g., eccentric, concentric, static;
 - c) muscle fibre types, e.g., slow twitch, fast twitch;
 - d) properties of muscle, e.g., contractility, elasticity, irritability;
 - e) function/role of muscles, e.g., flexor, extensor, abductor, adductor.
6. In pairs, students describe the characteristics and role of muscles during a "dynamic or static movement lab" through one of the following activities:
 - a) Students perform various exercises, e.g., bicep curl, tricep extension, sit up, lat pull-down, to complete a lab worksheet. Exercises can be performed in a classroom using surgical tubing or in a weight room.

OR

- b) Students examine photographs of various exercises, e.g., bicep curl, tricep extension, sit up, lat pull down, to complete a lab worksheet.

The lab worksheet should include information on identifying:

- the exercise, e.g., biceps curl;
- the bones involved, e.g., humerus, scapula;
- the agonist, e.g., biceps brachii;
- the antagonist, e.g., triceps brachii;
- the type of contraction, e.g., concentric;
- the function of the agonist muscle, e.g., elbow flexor.

-
7. In groups, students use the resources, e.g., software, video, Internet sites, textbooks provided to complete worksheets describing the features of neuromuscular principles and theories, e.g., sliding filament theory, use of adenosine triphosphate, motor unit. Each group presents its findings to the class. Following the oral presentations, using an answer sheet provided by the teacher, students check for correctness.
 8. After completing research using resources, e.g., Internet, software programs, textbooks, an interview with someone who has had an athletic injury, students complete an oral and/or written assignment that includes a:
 - a) picture of a movement skill, e.g., tennis forehand, baseball pitch, football tackle, alpine skiing;
 - b) description of the movement of the joints involved in the picture;
 - c) list of bones and muscles involved in the picture;
 - d) description of the vulnerability of joint(s) involved, e.g., muscle imbalances, male/female differences, joint structure;
 - e) summary of current medical procedures for treatment, e.g., arthroscopic surgery, ligament reconstruction, joint replacement.

Students submit the assignment to be evaluated by the teacher.

9. Students continue to add new terminology to an ongoing “glossary of terms.”

Assessment & Evaluation of Student Achievement

The teacher and students gather evidence of learning expectations outlined for this activity through:

- a formative peer assessment of worksheets on joint movement using an observation checklist (BBV.01, BB1.01);
- a formative peer and teacher assessment of an oral presentation describing neuromuscular theories and principles (e.g., sliding filament theory, ATP, concentric, eccentric, and static contraction) using a checklist (used by the peer) and a communication rubric (used by the teacher) (BB1.03);
- a summative evaluation of an oral or written assignment on the function of the skeletal and muscular systems and joint mechanics related to human movement using a marking scheme (BB1.02, BB2.02).

Resources

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Activity 3: Moving Through the Body: Cardiorespiratory System and Energy Production

Time: 11 hours

Description

Students demonstrate an understanding of the body's ability to perform and function during physical activity and sport. They investigate the acute and chronic effects of physical activity. Students also demonstrate an understanding of the relationship between the cardiorespiratory system and the production of energy.

Strand(s) & Learning Expectations

Strand(s): The Biological Basis of Movement

Overall Expectations

BBV.01 - describe the structure and function of the body and of physiological principles relating to human performance.

Specific Expectations

BB1.04 - demonstrate an understanding of the energy systems (e.g., ATP/PC, anaerobic and aerobic systems) and their contribution to muscular contraction and activity (e.g., as in long distance running as compared to sprinting);

BB1.05 - demonstrate an understanding of the relationship between the cardiorespiratory system and the production of energy (e.g., the transporting of nutrients and oxygen to the working muscles);

BB1.06 - describe the acute and chronic effects of physical activity on the body (e.g., increased cardiac output, increased endorphin levels, increased muscular strength and endurance).

Planning Notes

The teacher should consider the following preparation for the delivery of this activity.

- Consult with the library/resource centre staff and/or computer staff to allow for independent student research.
- Prepare activity task cards for experiential learning activity.
- Provide a blank diagram of the heart and prepare lecture notes on the heart and the circulatory system
- Prepare handouts on the function of the heart.
- Provide envelopes with puzzle pieces of various parts of the heart with their functions and definitions and provide a correct puzzle of the heart with matched functions and definitions.
- Prepare lecture notes and worksheets on the functions of the heart.
- Provide “The Roles of the Blood” chart cards and correct chart handout.
- Provide a blank diagram of the respiratory system and prepare lecture notes on the respiratory system.
- Prepare cards and a checklist with terms associated with the transporting of nutrients and oxygen to the muscles.
- Prepare lecture notes on the energy systems.
- Prepare a checklist for the energy systems and contribution to muscular contraction activity.
- Prepare a communication rubric for the oral presentation of acute or chronic effects of physical activity on the body.

Prior Knowledge & Skills

To successfully accomplish the activities in this unit, students should have:

- note-taking skills;
- library/resource centre and Internet research skills;
- lab work skills;
- oral presentation skills;
- group work skills.

Teaching/Learning Strategies

1. In groups, students select an activity task card. The tasks could include jogging on the spot, walking, or sitting. The groups perform their tasks for 5 to 10 minutes. Students brainstorm to list some of the physiological symptoms of changes that were experienced during the prescribed physical activity.

Some symptoms to consider for discussion could include:

- a) an increased heart rate or pulse rate
- b) increased breathing
- c) the general feeling of the body, e.g., perspiration, increase in body temperature
- d) the inability to talk
- e) the rate of fatigue

Each group creates a mind map based on their physical activity and its effects on the body. Groups share their findings with the class. Lead a class discussion by asking; “which system(s) is/are most affected during physical activity, e.g., cardiorespiratory system?”

2. Provide students with a blank diagram of the heart and have them label what they know. Through lecture format, students make notes and correct their diagrams as appropriate information is provided. Lecture information could include:
 - a) parts of the heart, e.g., chambers, valves
 - b) properties of blood vessels, e.g., arteries, capillaries, veins
 - c) the blood pathway through the heart
3. In a think/pair/share format, ask students to think about how the heart functions. In pairs, students brainstorm and list the functions of the heart, e.g., systemic, pulmonary, and coronary circulation. Ask groups to share their findings with the class. Record the information on chart paper. Use this information to lead a teacher-directed lecture related to the roles of each of the three types of circulation. Provide the appropriate handouts.
4. Divide the class into groups of three or four. Give each group an envelope of the various parts of the heart, e.g., atria, ventricles, septum, with its functions and definitions, e.g., systemic circulation, pumping blood to and from the body. Students reconstruct the heart in a puzzle format and match functions with their definitions. Following the activity, ask an individual student from each group to place a piece of the puzzle on the board in the correct position with the matched functions and definitions. Students check their work with the correct model of the heart with the matched functions and definitions posted on the board.
5. Using a lecture format and providing resources, e.g., computer-assisted, video, and handouts, students complete worksheets, e.g., diagrams, fill in the blanks, colouring, and make notes on the functions of the heart. Information should include:
 - a) pathway of conduction, e.g., SA Node, VA Node
 - b) cardiac cycle, e.g., systole, diastole
 - c) stroke volume
 - d) cardiac output
 - e) heart rate
6. Place a small test tube of red juice in front of the class to symbolize blood. Ask students to think about the relationship between blood and physical activity. As a class, brainstorm a list of the roles blood plays in the body. On the board, randomly scramble and place cards in a chart format. The cards describe various parts of the blood, its compositions and its roles/functions. Have two students attempt to arrange the cards correctly. Choose a student in the class who has the correct chart and provides classmates with feedback on how many cards they have placed correctly. Select various pairs of students to attempt further correction until the chart is completed. Provide students with the correct chart handout (see chart) and discuss the importance of blood within the cardiorespiratory system.

Name	Composition	Role/Function
Blood Plasma	Dissolved Substances Water	Carries waste materials, nutrients, dissolved oxygen, and hormones
Blood Cells	Red blood cells	Contain a protein called haemoglobin, an oxygen and carbon dioxide carrying molecule
	White blood cells	Proactive system; fight infection and bacteria
	Platelets	Help stop bleeding by forming blood clots

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7. Provide students with a blank diagram of the respiratory system. Have students label what they know on the diagram, e.g., trachea, bronchioles, alveoli. Through lecture, students can correct their diagrams as appropriate information is provided. Lecture information could include:
 - a) parts of the respiratory system and their function
 - b) internal and external respiration
 - c) inhalation and exhalation
 - d) gas exchange
 - e) role of red blood cells
 8. In a numbered-heads format, e.g., students number off four in a group, provide each group with cards on terms associated with the transportation of nutrients and oxygen to the muscles, e.g., pulmonary veins, arterioles, bronchi. Ask each group to organize their cards visually on their desks to demonstrate the “path of nutrients and oxygen to the muscles” in order from:
 - a) inhalation of air to the lungs
 - b) into the heart
 - c) to the body, e.g., working muscle, cellular level
 - d) back to the heart
 - e) back to the lungs

Students colour or circle each word blue or red according to whether or not the structure is oxygenated (red) or deoxygenated (blue). Set a time limit for each group to complete their visual organizer. Once the organizer is completed, call a number and the student with that number in each group describes the first segment of the “path of nutrients and oxygen to the muscles” listed above. Repeat the process until the entire pathway of nutrients and oxygen is completed. Provide each group with an answer sheet outlining the correct pathway of nutrients and oxygen throughout the body and peers check for correctness.

9. As a class discussion, ask students to give examples of various types of physical activity, e.g., sprint start, 400-metre front crawl, soccer, and marathon running. In pairs, using the list of physical activities students discuss the following:
 - a) What type of energy is required?
 - b) How is the energy provided?
 - c) What limits the energy supply?

Following the class discussion, and in a lecture format, compare the three energy systems, e.g., anaerobic lactic, anaerobic alactic and aerobic. Students should make notes. Information could include the following:

- a) range of maximum work times, e.g., 0 – 10 seconds, 10 – 120 seconds, 120 seconds plus
 - b) oxygen required
 - c) lactic acid produced
 - d) energy source, e.g., ATP, fats, carbohydrates
 - e) muscle fibre recruited, e.g., fast twitch, slow twitch
10. In groups of two to four, using either activity a) or b) below, students describe the energy systems and their contribution to muscular contraction and physical activity on a worksheet. Students should outline the following information.
 - the energy system(s) used, e.g., energy source, rate of fatigue, in the physical activity or sport
 - the muscle fibre(s) recruited in the physical activity or sport
 - the limitations of the energy system(s)

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- a) Students choose three physical activities and or sports, e.g., aerobic, anaerobic lactic and anaerobic alactic, from a provided list.

OR

- b) Students perform an aerobic activity, e.g., three minute step test, two minutes continuous skipping), anaerobic lactic activity, e.g., 100 metre sprint, 30 seconds of vertical jumping, and anaerobic alactic activity, e.g., one vertical jump, shot put.
In both activities, students hand in the worksheet to be assessed.

11. In pairs, students prepare a 5- to 10-minute oral presentation for evaluation, which describes an acute and chronic effect of physical activity on the body, e.g., VO₂ max, increased cardiac output, increased muscular strength and endurance, increased endorphin levels.
Research can be started in class time, in the library or the computer lab and then finished independently.
12. Students continue to add new terminology to an ongoing “glossary of terms.”

Assessment & Evaluation of Student Achievement

The teacher and students gather evidence of learning expectations outlined for this activity through:

- a formative peer assessment of a visual organizer describing the relationship between the cardiorespiratory system and the production of energy using a checklist (BB1.05);
- a formative evaluation of a worksheet describing the energy systems and their contribution to muscular contraction and physical activity using an answer key checklist (BBV.01, BB1.04);
- a summative evaluation of an oral presentation on a researched acute and chronic effect topic, e.g., increased cardiac output, VO₂ Max, using a communication rubric (BB1.06).

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