Ontario

Motive Power Technician Program Standard

The approved program standard for Motive Power Technician programs of instruction leading to an Ontario College Diploma delivered by Ontario Colleges of Applied Arts and Technology. (MTCU funding code 56405)

Ministry of Colleges and Universities
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Contents

Introduction

This document is the Program Standard for the Motive Power Technician programs of instruction leading to an Ontario College Diploma delivered by Ontario Colleges of Applied Arts and Technology (MTCU funding code 56405).

Development of system-wide program standards

In 1993, the Government of Ontario initiated program standards development with the objectives of bringing a greater degree of consistency to college programming offered across the province, broadening the focus of college programs to ensure graduates have the skills to be flexible and to continue to learn and adapt, and providing public accountability for the quality and relevance of college programs.

The Program Standards Unit of the Ministry of Colleges and Universities has responsibility for the development, review and approval of system-wide standards for programs of instruction at Ontario Colleges of Applied Arts and Technology.

Program standards

Program standards apply to all similar programs of instruction offered by Colleges of Applied Arts and Technology across the province of Ontario. Each program standard for a postsecondary program includes the following elements:

- **Vocational standard** (the vocationally specific learning outcomes which apply to the program of instruction in question)
- **Essential employability skills** (the essential employability skills learning outcomes which apply to all programs of instruction)
- **General education requirement** (the requirement for general education in postsecondary programs of instruction)

Collectively, these elements outline the essential skills and knowledge that a student must reliably demonstrate in order to graduate from the program.

Individual Colleges of Applied Arts and Technology offering the program of instruction determine the specific program structure, delivery methods and other curriculum matters to be used in assisting students to achieve the outcomes articulated in the standard. Individual colleges also determine whether additional local learning outcomes will be required to reflect specific local needs and/or interests.

The expression of program standards as vocational learning outcomes

Vocational learning outcomes represent culminating demonstrations of learning and achievement. They are not simply a listing of discrete skills, nor broad statements of knowledge and comprehension. In addition, vocational learning outcomes are interrelated and cannot be viewed in isolation from one another. As such, they should be viewed as a comprehensive whole. They describe performances that demonstrate that significant integrated learning by graduates of the program has been achieved and verified.

Expressing standards as vocational learning outcomes ensures consistency in the outcomes for program graduates, while leaving to the discretion of individual colleges, curriculum matters such as the specific program structure and delivery methods.

The presentation of the vocational learning outcomes

The **vocational learning outcome** statements set out the culminating demonstration of learning and achievement that the student must reliably demonstrate before graduation.

The **elements of the performance** for each outcome define and clarify the level and quality of performance necessary to meet the requirements of the vocational learning outcome. However, it is the performance of the vocational learning outcome itself on which students are evaluated. The elements of performance are indicators of the means by which the student may proceed to satisfactory performance of the vocational learning outcome. The elements of performance do not stand alone but rather in reference to the vocational learning outcome of which they form a part.

The development of a program standard

In establishing the standards development initiative, the Government of Ontario determined that all postsecondary programs of instruction should include vocational skills coupled with a broader set of essential skills. This combination is considered critical to ensuring that college graduates have the skills required to be successful both upon graduation from the college program and throughout their working and personal lives.

A program standard is developed through a broad consultation process involving a range of stakeholders with a direct interest in the program area, including employers, professional associations, universities, secondary schools and program graduates working in the field, in addition to students, faculty and administrators at the colleges themselves. It represents a consensus of participating stakeholders on the essential learning that all program graduates should have achieved.

Updating the program standard

The Ministry of Colleges and Universities will undertake regular reviews of the vocational learning outcomes for this program to ensure that the Motive Power Technician Program Standard remains appropriate and relevant to the needs of students and employers across the Province of Ontario. To confirm that this document is the most up-to-date release, please contact the Ministry of Colleges and Universities.

Vocational standard

All graduates of Motive Power Technician programs have achieved the six vocational learning outcomes (VLOs), in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble

The motive power field encompasses motive power operations systems that are driven from a variety of energy sources, such as gasoline, diesel, liquid petroleum gas, natural gas, other fuel, and propulsion including, but not limited to electric and hybrid systems.

Graduates of the Motive Power Technician diploma program will have demonstrated achievement of vocational learning outcomes that include the essential skills, knowledge, and attitudes for entry-level positions across motive power industry.

Achievement of the vocational learning outcomes will prepare graduates to diagnose, recommend repairs and use a variety of troubleshooting techniques and test equipment. In addition, graduates will explore alternate propulsion systems. All work will be done employing safe working practices according to industry and manufacturer standards. Graduates will be ready to use the vocabulary, communication skills, documentation, and electronic service information applicable to motive power industry. Graduates will be equipped with the fundamentals for their industry with varying degrees of practical exposure. Colleges may also offer specializations or enhancements within the scope of these standards. Successful completion of the diploma program prepares students for entry-level positions within their chosen industry.

Graduates of Motive Power Technician programs work in a broad range of employment settings in businesses and industries in both large and small organizations, such as dealerships, manufacturers, service and repair facilities, and retail stores. Their activities may include entry-level motive power positions such as apprentice technician, parts and service counter representative, and entry-level administrative positions within a motive power setting.

Opportunities exist for graduates to pursue further educational qualification or occupational certification; through apprenticeship or through articulation agreements between the colleges, graduates may be granted credits towards further education. Students should contact individual colleges for further details of a potential articulation agreements or credit transfer opportunities with other institutions, and professional associations for industry certification.

Note: The Ontario Council on Articulation and Transfer (ONCAT) maintains the provincial postsecondary credit transfer portal, ONTransfer.

Synopsis of the vocational learning outcomes
Motive Power Technician (Ontario College Diploma)

The graduate has reliably demonstrated the ability to:

1. Describe the operation, routine maintenance, and repair procedures of components and sub-components to characterize motive power systems with different energy sources.
2. Disassemble, assemble, test, and inspect components and sub-components to maintain, diagnose and repair motive power systems.
3. Diagnose motive power systems to recommend repairs.
4. Use electronic service information to diagnose and plan motive power repairs or maintenance of motive power systems.
5. Document maintenance, inspection, and repair records for business and client records.
6. Perform all assigned work and safety procedures according to manufacturers' service information, applicable codes, and regulations.

Note: The learning outcomes have been numbered as a point of reference; numbering does not imply prioritization, sequencing, nor weighting of significance.

The vocational learning outcomes

1. The graduate has reliably demonstrated the ability to: describe the operation, routine maintenance, and repair procedures of components and sub-components to characterize motive power systems with different energy sources.

Elements of the performance

a. Engine
   i. identify different engine types and sizes used in motive power industry.
   ii. explain the operating characteristics of internal combustion engines.
   iii. identify various internal and external engine components.
   iv. describe the operation of cooling systems and components.
   v. state the function and operation of lubrication systems and components.

b. Brakes
   i. classify the mechanical brake system components and subassemblies.
   ii. differentiate and characterize hydraulic brake system components and subassemblies.
   iii. identify and specify air brake system components and subassemblies.
   iv. describe electric brake system components and subassemblies.
   v. distinguish power brake assist systems and control components.
   vi. specify and outline the principles of anti-lock braking systems and components.
   vii. describe the operation of regenerative braking system.

c. Drivetrain
   i. identify clutch systems and components and describe operations.
   ii. explain basic gear theory and operation.
   iii. describe the operation of manual transmissions/transaxles.
   iv. identify internal and external manual transmission/transaxle components.
   v. describe internal and external automatic transmission/transaxle components.
   vi. identify various driveline configurations.
   vii. describe the operation of automatic transmissions/transaxles.

d. Suspension
   i. classify various suspension system designs.
   ii. describe the purpose and operation of suspension system dampeners.
   iii. describe the purpose and operation of suspension system springs.
   iv. describe the operation of ball joint designs.
   v. describe the design and function of control arm designs.

e. Steering
   i. describe the operation of steering linkage designs.
   ii. describe the design and operation of power assist systems and components.

iii. define the purpose and function of steering angles.
iv. describe the operation of wheel alignment equipment.

f. Wheels & Tires
   i. describe the design and construction of tires.
   ii. describe various wheel rim designs.
   iii. describe the operation of wheel and tire mounting and balancing equipment.
   iv. describe the function of tire pressure monitoring systems.

g. Fuel & Alternate Fuel
   i. describe gasoline fuel systems and list components.
   ii. identify diesel fuels systems and components.
   iii. identify the liquified petroleum gas fuel systems and component.
   iv. describe natural gas fuel systems and components.
   v. compare other alternate fuel systems and components.

h. Emissions
   i. Identify intake and exhaust systems and components.
   ii. compare gasoline emission systems and components.
   iii. Identify diesel emission systems and components.
   iv. explain liquified petroleum gas emission systems and components.
   v. explain natural gas emission systems and components.
   vi. explain other alternate emission systems and components.

i. Fluid Power
   i. classify fluid power systems and components.
   ii. describe the design and operation of hydraulic systems and components.
   iii. describe the purpose and operation of pneumatic systems and components.

j. Electrical & Electronics
   i. identify and describe the design and operation of battery, starting and charging systems.
   ii. describe various circuits designs and protection devices.
   iii. describe the design and operation of various sensors and circuits.
   iv. describe the operation of control modules and communication networks.
   v. describe the design and operation of various ignition systems and components.
   vi. describe the design and operation of various body electrical components and circuits.
   vii. identify and define fundamental electrical properties of voltage types, amperage, and resistance.
   viii. identify different types of locking mechanisms on wiring harness plugs and sensors.

k. Climate Control

i. describe the design and operation of heating, ventilation and air conditioning systems and components.
ii. describe the operation of various heating, ventilation and air conditioning tools and equipment.

l. Alternate Propulsion Systems
i. compare hybrid and electric vehicles systems and components.
ii. describe high voltage cooling and heating systems.
iii. differentiate and describe high voltage charging systems.
iv. classify high voltage safety interlock systems.
v. explain drive motor components.
vi. determine high voltage wiring.
vii. define control modules and circuits.
viii. identify and list appropriate personal protective equipment for working with various voltage systems following manufacturers recommendations.
ix. identify various mid/high voltage batteries and related components.
x. classify different power source technologies used in alternate propulsion systems.

m. Body and Structure
i. classify the body structure types in motive power industry.
ii. identify and describe subsystems within different body structure styles.
iii. describe manufacturing and assembly processes of different body structures.
iv. identify the tools and equipment required to repair body structure systems.
v. identify components of recreational vehicle accessories including, plumbing, satellite, vents, power vents, awning, hitching, solar panel etc.

2. The graduate has reliably demonstrated the ability to: disassemble, assemble, test, and inspect components and sub-components to maintain, diagnose and repair motive power systems.

Elements of the performance

a. Engine
    i. measure and inspect engine components for wear or component failure.
    ii. disassemble and assemble various.
        - engine short block designs and related components.
        - cylinder head designs and related components.
        - timing drive designs and related components.

b. Brakes
    i. disassemble, assemble, test, and inspect brake friction assemblies and components.
        - power brake assist components.
        - brake hydraulic components.
        - brake pneumatic components.

c. Drivetrain
    i. disassemble, assemble, test, and inspect various.
        - manual transmission designs and components.
        - automatic transmission designs and related components.
        - clutch designs and related components.
        - differential designs and related components.
        - driveshaft and axle designs and related components.
        - torque convertor designs

d. Suspension
    i. disassemble, assemble, test, and inspect various wheel hub designs and related components.

e. Steering
    i. disassemble, assemble, test, and inspect various.
        - steering column designs and related components.
        - steering gear designs and related components.
        - power steering assist components.

f. Wheels & Tires
    i. disassemble, assemble, and inspect wheel assemblies (tires and rims) and balance.

g. Fuel & Alternate Fuels
    i. disassemble, assemble, test, and inspect.
        - fuel tanks and related components.

- fuel rails and related components.

h. Fluid Power
    i. disassemble, assemble, test, and inspect.
        - hydraulic steering components.
        - hydraulic brake components.
        - heavy duty cylinders, motors, pumps, filters, accumulators, reservoirs (truck and coach only).

i. Electrical & Electronics
    i. disassemble, assemble, test, and inspect starters, alternators, and related components.

j. Climate Control
    i. disassemble, assemble, test, and inspect various.
        - heating, ventilation and air conditioning box designs and related components.
        - air conditioning compressor designs and related components.

k. Alternate Propulsion Systems
    i. disassemble and reassemble mid/high voltage batteries and related components.
        - disassemble and reassemble various electric drive motors and related components.
        - disassemble and assemble various gear reduction components.
        - disassemble and reassemble various thermal management components.
    ii. test and inspect low voltage batteries and subsystems.

l. Other
    i. select and use tools, equipment, and processes safely to remove, replace, and assemble components.
    ii. install and remove fasteners according to manufacturer's specifications.
    iii. install and remove fasteners and components during assembly and reassembly.
    iv. utilize appropriate measuring devices for the purpose of disassembly and reassembly.
    v. use service techniques such as drilling, tapping and thread repair where required for disassembly and reassembly.
    vi. use heating and welding equipment as required for disassembly and reassembly.

3. The graduate has reliably demonstrated the ability to: diagnose motive power systems to recommend repairs.

Elements of the performance

a. Engine
   i. inspect and test engine cooling systems.
   ii. inspect and test belts and pulleys.
   iii. inspect and test lubrication systems.
   iv. perform maintenance procedures in accordance with industry standards (e.g., lubrication, oil change, filter change).
   v. diagnose wear or failure of engine components.

b. Brakes
   i. inspect parking brake mechanical and electrical systems and components.
   ii. inspect and recommend repairs for disc brake assemblies.
   iii. service disc brake assemblies.
   iv. inspect drum brake assemblies.
   v. service drum brake assemblies.
   vi. inspect recreational vehicle trailer brake assemblies.
   vii. service recreational vehicle trailer brake assemblies.
   viii. inspect and test braking system hydraulic components.
   ix. inspect and test braking system pneumatic components.
   x. inspect and test power brake assist systems and components.
   xi. diagnose and repair antilock brake systems.

c. Drivetrain
   i. apply diagnostic procedures to various clutch system design.
   ii. adjust and/or replace clutch assemblies.
   iii. perform diagnostic procedures to manual transmissions/ transaxles.
   iv. perform diagnostic procedures for automatic transmissions/ transaxles.
   v. inspect and test components in different driveline configurations.

d. Suspension
   i. inspect and test suspension system components and subassemblies.
   ii. inspect and test recreational vehicle suspension systems.

e. Steering
   i. inspect and test steering linkage component.
   ii. inspect and test power assist mechanical and electrical components.
   iii. align and/or calibrate steering systems as required.
   iv. perform lubrication of steering system components, as required.

f. Wheels & Tires
   i. select and use diagnostic tools and equipment for wheel and tire assemblies.
   ii. inspect tires for wear and damage.

iii. inspect wheel rims for damage and wear.
iv. inspect wheel fasteners and mounting systems.
v. inspect and test tire pressure monitoring systems and components.
vi. check wheel balance and service as required.

g. Fuel & Alternate Fuels
   i. inspect and test gasoline fuel, diesel, liquid petroleum gas, natural gas and/or other fuel systems and components.
   ii. remove and replace fuel filters and other related components.
   iii. Inspect and recommend repairs for fuel line fitting disconnect design.

h. Emissions
   i. inspect and test gasoline, diesel, liquid petroleum gas, natural gas, and/or other emission components.
   ii. inspect and test intake and exhaust systems and operation of related emission sensors and components.
   iii. inspect and test the operation of various emission sensors and components.

i. Fluid Power
   i. inspect and test the operation of fluid systems.
   ii. inspect motive power systems that utilize hydraulic and pneumatic principles.
   iii. inspect operations of the recreational vehicle leveling systems and slideouts.

j. Electrical & Electronics
   i. inspect, test, and recommend repairs for the following electrical and electronic systems and components:
      - batteries
      - charging systems and components
      - starting systems and components
      - circuits and circuit protection devices
      - ignition systems and components
      - sensors and circuits
      - control modules and circuits communication networks
      - body electrical and accessory components and circuits

k. Climate Control
   i. test performance of heating, ventilation, and air conditioning systems using appropriate tools and equipment.
   ii. inspect subsystems of heating, ventilation, and air conditioning temperature control, air flow, mechanical components, electrical (devices and circuits).

l. Alternate Propulsion Systems
   i. inspect and recommend repairs for disconnect system.
   ii. inspect and test high voltage equipment cooling and heating systems.
   iii. inspect high voltage batteries and the remaining operational life cycle.

iv. inspect drive motor components and its regenerative operations.
v. inspect operations of the vehicle control systems.

m. utilize appropriate measuring devices for the purpose of system and component diagnostics.

4. The graduate has reliably demonstrated the ability to: use electronic service information to diagnose and plan motive power repairs or maintenance of motive power systems.

Elements of the performance

a. retrieve and interpret electronic schematics for the purpose of diagnosing system and circuit faults.
b. utilize diagnostic flow charts to address faults.
c. select and apply electronic service information to repair procedures.
d. analyze descriptions and operations in electronic service information for diagnosis and repair.
e. locate and utilize specifications required to repair and maintain motive power systems.
f. locate and follow manufacturer's maintenance schedules.
g. locate and interpret recalls and technical service bulletins for the purpose of diagnosis and repairs.
h. locate and utilize labour time guides for the purpose of estimating costs and repair times.
i. utilize electronic parts catalogues for the purpose of estimating repair costs and inventory control.

5. The graduate has reliably demonstrated the ability to: document maintenance, inspection, and repair records for business and client records.

Elements of the performance

a. prepare and complete sample workorders to document customer complaint, cause, and recommended correction of system problems.
b. list parts used to correct system problems.
c. record and enter information and data using applicable software and/or paper-based forms.
d. inspect the vehicle and check all items listed on the pre-delivery inspection forms.
e. complete vehicle inspection forms for preventative maintenance and report repair requirements.
f. use industry terminology for parts, components, and operations in record keeping.

6. The graduate has reliably demonstrated the ability to: perform all assigned work and safety procedures according to manufacturers' service information, applicable codes, and regulations.

Elements of the performance

a. perform safe moving and repositioning of large/heavy vehicles and equipment.
b. describe environmental, health and safety legislation, codes, and regulations.
c. describe human rights and employment standards within the scope of the motive power industry.
d. interpret applicable requirements and standards for the purpose of vehicle inspections in the motive power industry.
e. describe the environmental and ecological sustainability in the context of motive power industry.
f. utilize and maintain appropriate personal protective equipment in accordance with current safety standards.
g. identify regular certification cycles of personal protective equipment and service equipment.
h. Identify and assess safety protocols of different voltage systems in motive power industry.
    i. review safe working practices and personal protective equipment.
    ii. safe high voltage system disabling and re-enabling (power down procedures).
    iii. identifying main components in the high and low voltage systems.
    iv. describe various voltage safety systems such as interlock and isolation resistance.
    v. describe AC and DC electricity safety principles related to motive power systems.
    vi. identify working voltage in various system to assess safety protocols.
    vii. identify wiring harnesses, colour coding and components within different voltage systems.
    viii. describe safe charging procedures for high voltage systems.
    ix. describe proper auxiliary battery charging and boosting methods.
    x. locate and apply proper testing procedures based on manufacturers' current service information.

Essential employability skills

All graduates of the Motive Power Technician program of instruction must have reliably demonstrated the essential employability skills learning outcomes listed below, in addition to achieving the vocational learning outcomes and meeting the general education requirement.

Context

Essential Employability Skills (EES) are skills that, regardless of a student's program or discipline, are critical for success in the workplace, in day-to-day living and for lifelong learning.

The teaching and attainment of these EES for students in, and graduates from, Ontario's Colleges of Applied Arts and Technology are anchored in a set of three fundamental assumptions:

- these skills are important for every adult to function successfully in society today
- our colleges are well equipped and well positioned to prepare graduates with these skills
- these skills are equally valuable for all graduates, regardless of the level of their credential, whether they pursue a career path, or they pursue further education

Skill categories

To capture these skills, the following six categories define the essential areas where graduates must demonstrate skills and knowledge.

- Communication
- Numeracy
- Critical Thinking & Problem Solving
- Information Management
- Interpersonal
- Personal

Application and implementation

In each of the six skill categories, there are a number of defining skills, or sub skills, identified to further articulate the requisite skills identified in the main skill categories. The following chart illustrates the relationship between the skill categories, the defining skills within the categories and learning outcomes to be achieved by graduates from all postsecondary programs of instruction that lead to an Ontario College credential.

EES may be embedded in General Education or vocational courses or developed through discrete courses. However, these skills are developed, all graduates with Ontario College credentials must be able to reliably demonstrate the essential skills required in each of the six categories.

Skill category: communication

Defining skills

Skill areas to be demonstrated by graduates:

- reading
- writing
- speaking
- listening
- presenting
- visual literacy

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience.
2. Respond to written, spoken or visual messages in a manner that ensures effective communication.

Skill category: numeracy

Defining skills

Skill areas to be demonstrated by graduates:

- understanding and applying mathematical concepts and reasoning
- analyzing and using numerical data
- conceptualizing

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Execute mathematical operations accurately.

Skill category: critical thinking and problem solving

Defining skills

Skill areas to be demonstrated by graduates:

- analyzing
- synthesizing
- evaluating
- decision making
- creative and innovative thinking

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Apply a systematic approach to solve problems.
2. Use a variety of thinking skills to anticipate and solve problems.

Skill category: information management

Defining skills

Skill areas to be demonstrated by graduates:

- gathering and managing information
- selecting and using appropriate tools and technology for a task or a project
- computer literacy
- Internet skills

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Locate, select, organize and document information using appropriate technology and information systems.
2. Analyze, evaluate and apply relevant information from a variety of sources.

Skill category: interpersonal

Defining skills

Skill areas to be demonstrated by graduates:

- teamwork
- relationship management
- conflict resolution
- leadership
- networking

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Show respect for the diverse opinions, values, belief systems and contributions of others.
2. Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.

Skill category: personal

Defining skills

Skill areas to be demonstrated by graduates:

- managing self
- managing change and being flexible and adaptable
- engaging in reflective practices
- demonstrating personal responsibility

Learning outcomes

The graduate has reliably demonstrated the ability to:

1. Manage the use of time and other resources to complete projects.
2. Take responsibility for one's own actions, decisions and their consequences.

General education requirement

All graduates of the Motive Power Technician program must have met the general education requirement described below, in addition to achieving the vocational and essential employability skills learning outcomes.

Requirement

The General Education Requirement for programs of instruction is stipulated in the Credentials Framework in the Minister's Binding Policy Directive Framework for Programs of Instruction.

In programs of instruction leading to either an Ontario College Diploma or an Ontario College Advanced Diploma, it is required that graduates have been engaged in learning that exposes them to at least one discipline outside their main field of study and increases their awareness of the society and culture in which they live and work. This will typically be accomplished by students taking 3 to 5 courses (or the equivalent) designed discretely and separately from vocational learning opportunities.

This general education learning would normally be delivered using a combination of required and elective processes.

Purpose

The purpose of General Education in the Ontario college system is to contribute to the development of citizens who are conscious of the diversity, complexity and richness of the human experience; who are able to establish meaning through this consciousness; and who, as a result, are able to contribute thoughtfully, creatively and positively to the society in which they live and work.

General Education strengthens students' essential employability skills, such as critical analysis, problem solving and communication, in the context of an exploration of topics with broad-based personal and/or societal importance.

Themes

The themes listed below will be used to provide direction to Ontario Colleges in the development and identification of courses that are designed to fulfil the General Education Requirement for programs of instructions.

Each theme provides a statement of Rationale and offers suggestions related to more specific topic areas that could be explored within each area. These suggestions are neither prescriptive nor exhaustive. They are included to provide guidance regarding the nature and scope of content that would be judged as meeting the intent and overall

goals of General Education.

Arts in society:

Rationale:

The capacity of a person to recognize and evaluate artistic and creative achievements is useful in many aspects of his/her life. Since artistic expression is a fundamentally human activity, which both reflects and anticipates developments in the larger culture, its study will enhance the student's cultural and self-awareness.

Content:

Courses in this area should provide students with an understanding of the importance of visual and creative arts in human affairs, of the artist's and writer's perceptions of the world and the means by which those perceptions are translated into the language of literature and artistic expression. They will also provide an appreciation of the aesthetic values used in examining works of art and possibly, a direct experience in expressing perceptions in an artistic medium.

Civic Life:

Rationale:

In order for individuals to live responsibly and to reach their potential as individuals and as citizens of society, they need to understand the patterns of human relationships that underlie the orderly interactions of a society's various structural units. Informed people will have knowledge of the meaning of civic life in relation to diverse communities at the local, national and global level and an awareness of international issues and the effects of these on Canada, as well as Canada's place in the international community.

Content:

Courses in this area should provide students with an understanding of the meaning of freedoms, rights and participation in community and public life, in addition to a working knowledge of the structure and function of various levels of government (municipal, provincial, national) in a Canadian and/or in an international context. They may also provide an historical understanding of major political issues affecting relations between the various levels of government in Canada and their constituents.

Social and cultural understanding:

Rationale:

Knowledge of the patterns and precedents of the past provide the means for a person to gain an awareness of his or her place in contemporary culture and society. In

addition to this awareness, students will acquire a sense of the main currents of their culture and that of other cultures over an extended period of time in order to link personal history to the broader study of culture.

Content:

Courses in this area are those that deal broadly with major social and cultural themes. These courses may also stress the nature and validity of historical evidence and the variety of historical interpretation of events. Courses will provide the students with a view and understanding of the impact of cultural, social, ethnic or linguistic characteristics.

Personal understanding:

Rationale:

Educated people are equipped for life-long understanding and development of themselves as integrated physiological and psychological entities. They are aware of the ideal need to be fully functioning persons: mentally, physically, emotionally, socially, spiritually and vocationally.

Content:

Courses in this area will focus on understanding the individual: his or her evolution; situation; relationship with others; place in the environment and universe; achievements and problems; and his or her meaning and purpose. They will also allow students the opportunity to study institutionalized human social behaviour in a systematic way. Courses fulfilling this requirement may be oriented to the study of the individual within a variety of contexts.

Science and technology:

Rationale:

Matter and energy are universal concepts in science, forming a basis for understanding the interactions that occur in living and non-living systems in our universe. Study in this area provides an understanding of the behaviour of matter that provides a foundation for further scientific study and the creation of broader understanding about natural phenomena.

Similarly, the various applications and developments in the area of technology have an increasing impact on all aspects of human endeavour and have numerous social, economic and philosophical implications. For example, the operation of computers to process data at high speed has invoked an interaction between machines and the

human mind that is unique in human history. This and other technological developments have a powerful impact on how we deal with many of the complex questions in our society.

Content:

Courses in this area should stress scientific inquiry and deal with basic or fundamental questions of science rather than applied ones. They may be formulated from traditional basic courses in such areas of study as biology, chemistry, physics, astronomy, geology or agriculture. As well, courses related to understanding the role and functions of computers (e.g., data management and information processing) and assorted computer-related technologies should be offered in a non-applied manner to provide students with an opportunity to explore the impact of these concepts and practices on their lives.

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