



Ontario
College of
Teachers

Ordre des
enseignantes et
des enseignants
de l'Ontario

Additional Qualification Course Guideline Teaching Transportation Technology - Light Aircraft

Schedule F Teachers' Qualifications Regulation

February 2015

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Additional Qualification Course Guideline

1. Introduction

The guideline for Teaching Transportation Technology - Light Aircraft is organized using the following framework.



Diagram 1: Guideline Organization

Teachers are able to take the Additional Qualification course: Teaching Transportation Technology - Light Aircraft if they hold a technological education qualification at Grades 9 and 10 or Grades 11 and 12 in the broad-based area of Teaching Transportation Technology.

The Additional Qualification Course: Teaching Transportation Technology - Light Aircraft employs a critical, pedagogical lens to explore in holistic and integrated manner theoretical foundations, development of learners, program planning and implementation, instructional practices, assessment and evaluation, the learning environment and ethical considerations related to teaching and learning.

The Ontario College of Teachers recognizes that candidates working in the publicly funded school system, independent/private institutions or First Nations schools will have a need to explore topics and issues of particular relevance to the context in which they work or may work.

Critical to the implementation of this course is the creation of positive learning experiences that reflect care, diversity and equity. This course supports the enhancement of professional knowledge, ethical practice, leadership and ongoing learning.

The French language and the English language communities will also need to implement these guidelines to reflect the unique contextual dimensions and needs of each community. Each of these language communities will explore the guideline content from distinct perspectives and emphasis. This flexibility will enable both language communities to implement Teaching Transportation Technology - Light Aircraft as understood from a variety of contexts.

The Teaching Transportation Technology - Light Aircraft additional qualification course guideline provides a conceptual framework for providers and instructors to develop and facilitate the Teaching Transportation Technology - Light Aircraft course. The guideline framework is intended to be a fluid, holistic and integrated representation of key concepts associated with Teaching Transportation Technology - Light Aircraft.

2. Regulatory Context

The College is the self-regulating body for the teaching profession in Ontario. The College's responsibility related to courses leading to additional qualifications includes the following:

- to establish and enforce professional standards and ethical standards applicable to members of the College
- to provide for the ongoing education of members of the College
- to accredit additional qualification courses or programs and more specifically,

The program content and expected achievement of persons enrolled in the program match the skills and knowledge reflected in the College's Standards of Practice for the Teaching Profession and the Ethical Standards for the Teaching Profession and in the program guidelines issued by the College.

(*Accreditation of Teacher Education Programs Regulation, Part IV, Subsection 24*).

Additional qualifications for teachers are identified in the *Teachers' Qualifications Regulation*. This regulation includes courses/programs that lead to Additional Qualifications, the Principal's Qualifications and the Supervisory Officer's Qualifications. A session of a course leading to an additional qualification shall consist of a minimum of 125 hours as approved by the Registrar. Accredited additional qualification courses reflect the *Ethical Standards for the Teaching Profession*, the *Standards of Practice for the Teaching Profession* and the *Professional Learning Framework for the Teaching Profession*.

The course developed from this guideline is open to candidates who meet the entry requirements identified in the *Teachers' Qualifications Regulation*.

Successful completion of the course leading to the Additional Qualification: Teaching Transportation Technology - Light Aircraft, listed in Schedule F of the *Teachers' Qualifications Regulation* is recorded on the Certificate of Qualification and Registration. Successful completion of three schedule F courses within a specific broad-based technology area will be deemed to be equivalent to one specialist or honour specialist qualification for purposes of entry into the principal's qualification or the supervisory officer qualification. (O. Rfor example, 176/10 S.49 (4) and (5))

In this document, all references to candidates are to teachers enrolled in the additional qualification course. References to students indicate those enrolled in school programs.

3. Foundations of Professional Practice

The *Foundations of Professional Practice* conveys a provincial vision of what it means to be a teacher in Ontario. This vision lies at the core of teacher professionalism. The *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* (Appendix 1) are the foundation for the development and in the realization of the Additional Qualification course. These nine standards, as principles of professional practice, provide the focus for ongoing professional learning and are the foundation for the development and implementation of the Additional Qualification Course: Teaching Transportation Technology - Light Aircraft. In addition, the

Professional Learning Framework for the Teaching Profession is underpinned by the standards, articulates the principles on which effective teacher learning is based and acknowledges a range of options that promote continuous professional learning. The ongoing enhancement of informed professional judgment, which is acquired through the processes of lived experience, inquiry, and reflection, is central to the embodiment of the standards and the Professional Learning Framework within this AQ course and professional practice.

The *Ethical Standards of the Teaching Profession* and the *Standards of Practice for the Teaching Profession* serve as guiding frameworks that underpin professional knowledge, skills and experiences that teachers require in order to teach effectively within and contribute to an environment that fosters *respect, care, trust and integrity*.

Teacher-Education Resources

The College has developed resources to support the effective integration of the standards within Additional Qualification courses and programs. These teacher education resources explore the integration of the standards within professional practice through a variety of educative, research and inquiry-based processes. This guideline has been designed to reflect the *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* and the *Professional Learning Framework for the Teaching Profession*. These resources can be found on the College web site (www.oct.ca). These resources support the development of professional knowledge and professional judgment through reflective practice. The lived experiences of Ontario educators are illuminated in the resources and serve as AQ course support for teacher education.

4. Conceptual Framework

The design, course content and implementation of the Additional Qualification Course Guideline: Teaching Transportation Technology - Light Aircraft support effective teacher education practices. These course guideline components provide a conceptual framework for the development of a holistic, integrated, experiential and inquiry-based course. The following conceptual framework supports and informs professional knowledge, judgment and practices within the Additional Qualification Course: Teaching Transportation Technology - Light Aircraft.

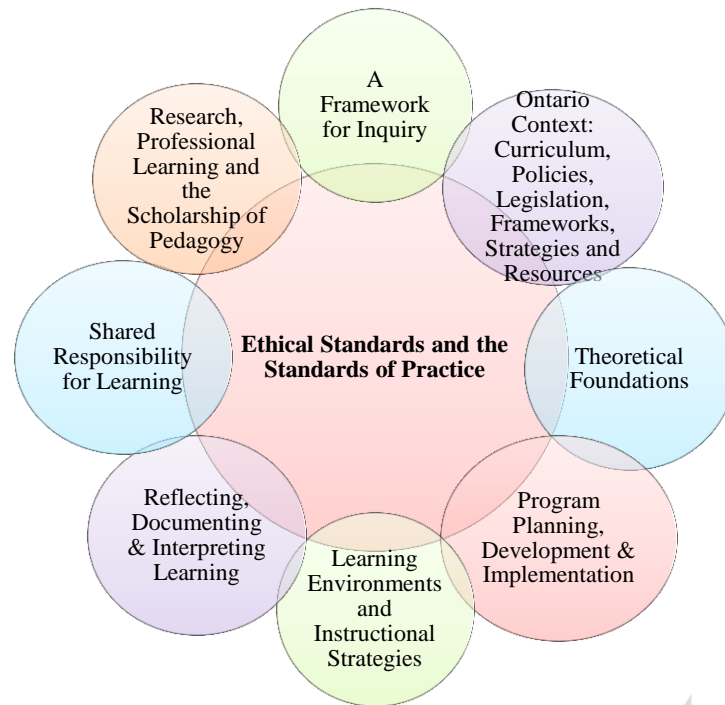


Diagram 2: Conceptual Framework for Teaching Transportation Technology - Light Aircraft

A. *The Ethical Standards for the Teaching Profession and the Standards of Practice for the Teaching Profession:*

The *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* represent a collective vision of professional practice. At the heart of a strong and effective teaching profession is a commitment to students and their learning. Members of the Ontario College of Teachers, in their position of trust, demonstrate responsibility in their relationships with students, parents, guardians, colleagues, educational partners, other professionals, the environment and the public.

The holistic integration of the standards within all course components supports the embodiment of the collective vision of the teaching profession that guides professional knowledge, learning, and practice. The following principles and concepts support this holistic integration within the AQ course.

- understanding and embodying care, trust, respect and integrity

- fostering commitment to students and student learning
- integrating professional knowledge
- enriching and developing professional practice
- supporting leadership in learning communities
- engaging in ongoing professional learning.

Through professional dialogue, collaborative reflection and an ethical culture, course candidates will continue to critically inquire into and refine professional practice and ethical culture through the lens of the *Standards of Practice for the Teaching Profession*.

B. A Framework for Inquiry

The *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* are embedded throughout the Additional Qualification course guideline.

This Additional Qualification course supports critical reflective inquiry and dialogue informed by the following:

- analyzing, interpreting and implementing Ontario's curriculum, district school board policies, frameworks, strategies and guidelines related to the Broad Based Technology
- developing awareness of First Nations, Métis and Inuit ways of knowing and perspectives
- extending theoretical understanding to design, implement and assess practices and/or programs
- implementing pedagogical strategies and assessment and evaluation practices that are linked to expectations, meet the individual needs of students, and promote student learning
- creating holistic learning environments conducive to the intellectual, social, emotional, physical, linguistic, cultural, spiritual and moral development of students
- working collaboratively with school personnel, parents/guardians, caregivers, the community, local business and industry as it relates to Teaching Transportation Technology - Light Aircraft

- exercising leadership in accessing a variety of resources, including technological resources, within and beyond the educational system to enhance and support student learning
- refining professional practice through ongoing collaborative inquiry, dialogue and reflection
- modelling ethical practices and addressing ethical issues
- critically exploring and integrating environmentally sustainable practices
- fostering responsible, active environmental citizenship
- collaboratively developing and sustaining professional learning communities for enhancing professional knowledge and supporting student learning
- fostering leadership in the integration of information and communication technology to enhance teaching and learning
- critically exploring innovative strategies to create and sustain safe, healthy, equitable and inclusive learning environments that honour and respect diversity and foster student learning
- understanding the importance of critically examining qualitative and quantitative research related to professional practice
- critically exploring strategies to understand, gain insight into and support learners' well-being and mental health needs
- working collaboratively with interdisciplinary school teams to develop and implement Individual Education Plans (IEPs) of students
- exploring strategies that contribute to a culture that promotes openness to innovation and change
- demonstrating an awareness of emerging technologies related to Teaching Transportation Technology - Light Aircraft
- demonstrating an awareness of health and safety risks associated with Teaching Transportation Technology - Light Aircraft
- applying knowledge and skills to create and maintain a safe learning environment that addresses program needs: curriculum, material handling, tool handling and equipment storage, supervision, safety standards and practices that are respectful of the environment
- demonstrating technological literacy related to Teaching Transportation Technology - Light Aircraft

- writing technical reports and creating and managing portfolios
- demonstrating mathematical literacy in Teaching Transportation Technology - Light Aircraft
- demonstrating an understanding of business management and entrepreneurial practices related to Teaching Transportation Technology - Light Aircraft
- inquiring into practice through reflection, active engagement and collaboration
- enhancing awareness of holistic learning environments
- understanding the various professional practices and career opportunities in Teaching Transportation Technology - Light Aircraft
- critically exploring the relationship between education, mental health and well-being
- identifying ways to modify expectations, instructional strategies and assessment practices in Teaching Transportation Technology - Light Aircraft.

C. Ontario Context: Curriculum, Policies, Legislation, Frameworks, Strategies and Resources

The Additional Qualification Course: Teaching Transportation Technology - Light Aircraft is aligned with current Ontario curriculum, relevant legislation, government policies, frameworks, strategies and resources. These documents inform and reflect the development and implementation of the Additional Qualification Course: Teaching Transportation Technology - Light Aircraft and can be viewed at www.edu.gov.on.ca.

Course candidates are also encouraged to critically explore the policies, practices and resources available at school and board levels that inform teaching and learning related to Teaching Transportation Technology - Light Aircraft.

D. Theoretical Foundations of Teaching Transportation Technology - Light Aircraft

- understanding theories of student development (social, emotional, physical, intellectual, linguistic, cultural, spiritual and moral)

- understanding Ontario curriculum, resources and government policies, frameworks and strategies related to Teaching Transportation Technology - Light Aircraft
- understanding learning theories and the particular learning needs of the adolescent in the Intermediate and Senior Divisions
- critically exploring a variety of conceptual frameworks related to Teaching Transportation Technology - Light Aircraft
- reflecting on teaching practice and engaging in professional dialogue regarding the relationship between theory and practice
- integrating the *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* as the foundation for teacher professionalism within the Additional Qualification Course: Teaching Transportation Technology - Light Aircraft
- critically exploring the significance of relevant legislation including the Ontario Human Rights Code, Ontarians with Disabilities Act, and the Accessibility for Ontarians with Disabilities Act (AODA) and associated responsibilities within professional practice
- recognizing teachers' legal obligations and ethical responsibilities according to current provincial legislation
- critically inquiring into the dimensions associated with creating and sustaining safe learning environments
- critically exploring holistic and inclusive educational programs that build on learners' abilities and empower them to reach their learning goals
- critically exploring problem solving processes, methods and approaches as they relate to Teaching Transportation Technology - Light Aircraft
- critically exploring the fundamental technological concepts in Teaching Transportation Technology - Light Aircraft.

E. Program Planning, Development and Implementation

- applying the *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* to inform a program planning framework
- critically exploring the influence of society's diverse and changing nature on student learning and well-being

- deepening understanding of program planning, development, implementation strategies and frameworks related to Teaching Transportation Technology - Light Aircraft
- deepening understanding of differentiated instruction, universal design and the tiered approach in program planning, development and implementation
- critically exploring learning resources (for example, print, visual, digital) that support student learning
- understanding the types of secondary school pathways (including apprenticeship, college, university, workplace) and their relationship to students' post-secondary goals and career opportunities
- critically exploring how students' lived experiences, development, strengths, interests and needs can inform program planning, development and implementation
- integrating culturally responsive pedagogy within program planning and development
- critically exploring strategies that support learners' well-being and mental health needs
- planning instructional strategies that integrate students' learning styles, strengths and experiences
- demonstrating leadership in implementing local and provincial guidelines and policies that support safe and effective learning environments
- inspecting and reporting on the learning environment, facilities, equipment needs, resources and state of maintenance and repair for delivering Teaching Transportation Technology - Light Aircraft
- applying the theoretical foundations of Teaching Transportation Technology - Light Aircraft by incorporating the broad-based pedagogical approach that embeds problem solving and the fundamental technological concepts
- identifying the safe, ethical and legal use of technology in Teaching Transportation Technology - Light Aircraft programs
- critically exploring and integrating multiple formal and informal assessment methods and data to inform program planning and support student learning.

F. Learning Environments and Instructional Strategies

- creating and sustaining positive, ethical, equitable, accepting and safe learning environments
- critically exploring strategies for fostering a collaborative community of empowered learners
- fostering engaging, trusting and inviting learning environments that promote student voice, leadership, critical inquiry and self-regulation
- critically exploring a variety of instructional strategies to support student learning
- developing strategies to create a positive and collaborative learning environment to support student learning
- cultivating safe, ethical and respectful practices in the use of technology in purposeful and legal ways
- integrating information and communication technologies that support student learning
- providing leadership in adapting instruction to meet the needs of all learners
- critically exploring strategies that engage students as active citizen in supporting environmental, social and economic sustainability
- using pedagogies that reflect the professional identity of educators as described in the *Ethical Standards for the Teaching Profession* and the *Standards of Practice for the Teaching Profession* and in the *Foundations of Professional Practice*
- creating inclusive learning environments that reflect the ethical standards and standards of practice
- implementing safe and effective management of a variety of technical learning environments
- planning, organizing and implementing effective health, safety, sanitation and environmental standards in the Teaching Transportation Technology - Light Aircraft facility
- demonstrating an understanding of facility design and maintenance practices as per industry standards

- understanding and complying with workplace health and safety legislation and standards related to Teaching Transportation Technology - Light Aircraft.

G. Reflecting, Documenting and Interpreting Learning

- collaboratively integrating fair and equitable, transparent, valid and reliable assessment and evaluation methods that honour the dignity, emotional wellness and cognitive development of all students
- critically exploring and collaboratively integrating assessment, evaluation and reporting practices that align with the principles and processes of Ontario's curriculum, frameworks and policy documents
- using assessment for the following three purposes: to provide feedback to students and to adjust instruction (assessment for learning); to develop students' capacity to be independent, autonomous learners (assessment as learning); to make informed judgements about the quality of student learning (assessment of learning)
- critically exploring the use of baseline data as well as current assessment data to reflect on how the students are progressing and the effectiveness of the learning strategies used.

H. Shared Responsibility for Learning

- critically exploring and collaboratively integrating a variety of effective communication and engagement strategies for authentic collaboration with parents/guardians, school/board personnel and community agencies
- critically exploring and engaging in strategies and opportunities for professional collaboration that supports student learning and well-being
- collaboratively designing programs that address biases, discrimination and systemic barriers in order to support student learning, well-being and inclusion
- fostering and sustaining a positive, inclusive educational culture in which all perspectives are encouraged, valued and heard
- understanding and respecting the importance of shared responsibility and partnership as conveyed in the standards and the Foundations of Professional Practice

- developing strategies to establish links between the school community, industry and the Teaching Transportation Technology - Light Aircraft program
- critically exploring sector-specific learning opportunities in other curriculum areas
- critically exploring professional collaboration within interdisciplinary teams to support student learning, self-advocacy and transitions.

I. Research, Professional Learning and the Scholarship of Pedagogy

- critically exploring past, present and evolving practices in Teaching Transportation Technology - Light Aircraft
- critically exploring professional practice through ongoing inquiry into theory and pedagogy/andragogy
- engaging in professional learning through research, scholarship and leadership
- integrating research and the scholarship of pedagogy/andragogy into teaching practice
- collaborating in research and the scholarship of pedagogy/andragogy
- critically exploring knowledge-creation and mobilization as professional practice.

5. Instructional Practice in the Additional Qualification Course: Teaching Transportation Technology - Light Aircraft

Candidates will collaboratively develop with course instructors the specific learning inquiries, learning experiences, and forms of assessment and evaluation that will be used throughout the course.

In the implementation of this Additional Qualification course, instructors use strategies that are relevant, meaningful and practical in providing candidates with learning experiences about instruction, pedagogy and assessment and evaluation. These include but are not limited to: experiential learning, small group

interaction; action research; presentations; independent inquiry; problem solving; collaborative learning and direct instruction.

Instructors model the *Ethical Standards of the Teaching Profession* and the *Standards of Practice for the Teaching Profession*, honour the principles of adult learning, recognize candidates' experience and prior learning and respond to individual needs. Important to the course are opportunities for candidates to create support networks and receive feedback from colleagues and instructors and share the products of their learning with others. Opportunities for professional reading, reflection, dialogue and expression are also integral parts of the course.

Instructors model effective instructional and assessment strategies that can be replicated or adapted in a variety of classroom settings.

A. Experiential Learning

Candidates will be provided with opportunities to engage in experiential learning related to key concepts and aspects of Teaching Transportation Technology - Light Aircraft as collaboratively determined by both the instructor and course candidates. The intent of the experiential learning opportunities is to support the application and integration of practice and theory within the authentic context of teaching and learning. Candidates will also engage in critical reflection and analysis of their engagement in experiential learning opportunities related to Teaching Transportation Technology - Light Aircraft. The professional judgment, knowledge and pedagogy of candidates will be enhanced and refined through experiential learning and inquiry.

The College's standards resources help to support experiential learning through various forms of professional inquiry.

6. Assessment and Evaluation of Candidates

At the beginning of the course, candidates will collaboratively develop with course instructors the specific learning inquiries, learning experiences, and forms of assessment and evaluation that will be used throughout the course. Instructors will provide opportunities for regular feedback regarding candidates' progress throughout the course.

A balanced approach to candidate assessment and evaluation is used. It includes the combination of candidate self and peer assessment, as well as instructor evaluation. The assessment and evaluation strategies reflect effective, collaborative and inquiry-based practices. A variety of assessment approaches will be used that enable candidates to convey their learning related to course inquiries. The course provides opportunities for both formative and summative assessment and evaluation.

Central to candidates enrolled in Additional Qualification courses is the opportunity to be engaged in relevant and meaningful inquiries. Assignments, artefacts and projects enable candidates to make connections between theory and practice. At the same time, assignments must allow candidates flexibility, choice and individual inquiry opportunities.

Part of the evaluation process may include a major independent project or action research component over the duration of the course. This project is an opportunity for candidates to illustrate a high level of professional knowledge, communication skills, pedagogy, ethical practices and instructional leadership. Similarly, if a portfolio assignment is used it will also include reflections and analysis of a candidate's learning over time.

A final culminating experience in the course is recommended. This experience may take the form of a written assessment, a research paper, a performance, an inquiry project or a product that is original, meaningful and practical.

The following list of assessment strategies which are reflective of experiential learning is not exhaustive; it is intended to serve as a guide only.

- a) Performance assessment: designing a sample unit which includes a culminating activity and appropriate assessment and evaluation tools, incorporates a variety of technologies and resources relevant to the study of Teaching Transportation Technology - Light Aircraft, and is based on Ministry of Education expectations
- b) Written assignment: reflecting critically on issues arising from articles, publications, research and/or other resources related to the teaching or practice to Teaching Transportation Technology - Light Aircraft
- c) Presentation: developing a digital story, presenting an issue related to the teaching and learning related to Teaching Transportation Technology - Light Aircraft

- d) Portfolio: creating a portfolio of practical resources, artefacts, photographs and recording critical reflections for one or several components related to Teaching Transportation Technology - Light Aircraft
- e) Action research: engaging in action research by reflecting and acting upon a specific inquiry into teaching practice related to Teaching Transportation Technology - Light Aircraft
- f) Independent project: addressing any aspect of the course that is approved by the instructor
- g) Instructional resource: developing a meaningful resource that will support instruction and pedagogy related to the teaching and learning of Teaching Transportation Technology - Light Aircraft
- h) Reflective writing: reflecting on professional practice through journal-writing, or writing a case or vignette that will support instruction and pedagogy related to the teaching and learning of Teaching Transportation Technology - Light Aircraft
- i) Case inquiry: writing or exploring a case related to collaboration and shared partnerships, with parents, colleagues, and community organizations
- j) IEP development: collaboratively develop an IEP related to Teaching Transportation Technology - Light Aircraft with the family, student and school team
- k) Facilitating a Learning Experience: developing and implementing an engaging learning experience that reflects differentiated instruction and universal design and the tiered approach.

7. Demonstrated Knowledge and Skill in Teaching Transportation Technology - Light Aircraft

Successful candidates will be able to demonstrate technical knowledge and skill in the following:

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>Understanding theory and concepts of flight for fixed wing aircraft</p> <p>Guiding Question: How does a fixed wing aircraft fly?</p>	<ol style="list-style-type: none"> Describe the properties of atmosphere including: <ul style="list-style-type: none"> -composition -static pressure -temperature -density -humidity -standard day Explain how lift is generated including: <ul style="list-style-type: none"> -Bernoulli's principle -Newton's third law -airfoil types -factors affecting lift -stall -angle of attack -drag -aspect ratio 	<ol style="list-style-type: none"> Perform the conversion of temperatures including: Celsius to Fahrenheit Work out temperature changes with altitude using ICAO standard day charts Calculate lift using formulas when variables are changed.

	Transportation Technology Fundamentals	Transportation Technology Skills
	<p>3. Explain how control and stability of an aircraft is achieved including:</p> <ul style="list-style-type: none"> -principle axes -primary flight controls -secondary flight controls -compound flight controls <p>4. Explain forces including centrifugal vs. centripetal</p> <p>5. Explain how an aircraft remains in a turn including:</p> <ul style="list-style-type: none"> -roll -yaw -rudder -aileron. 	
<p>Understanding aircraft flight control systems and major components</p> <p>Guiding Question: How is a fixed wing aircraft</p>	<p>1. Identify various flight control systems including:</p> <ul style="list-style-type: none"> -control cable system -control rod operated system -hydraulically operated system -fly by wire system <p>2. Discuss flight control system components including:</p>	<p>1. Demonstrate the ability to identify primary and secondary flight controls and describe their functions including Piper Aztec PA-23</p> <p>2. Perform the correct tensioning, rigging and securing of light aircraft control cables including Cessna 150</p> <p>3. Perform wear inspections on a flight control - for example, radial type wear in control bearings.</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
controlled and maneuvered in flight?	<ul style="list-style-type: none"> -control yoke -rudder pedals -control cables -control pulleys -control rods -bell cranks -hydraulic fluids -hydraulic reservoirs -hydraulic filters -hydraulic pumps -hydraulic actuators <p>3. Identify flight control surface functions and their relationship with one another including:</p> <ul style="list-style-type: none"> -primary flight controls -secondary flight controls -compound flight controls <p>4. Explain flight control inspections including:</p> <ul style="list-style-type: none"> -types of wear -typical locations of flight control wear. 	
Understanding light aircraft flight control instrument	<p>1. Identify and explain the functions and relationships of the various flight instruments used to control and indicate flight operation including:</p>	<p>1. Conduct a compass swing (actual or simulated)</p> <p>2. Demonstrate the ability to identify various flight operation instruments in the cockpit - for example,</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>clusters</p> <p>Guiding Question: What cockpit indication equipment is available to the fixed wing aircraft flight operator to inform him/her of proper aircraft flight operation?</p>	<ul style="list-style-type: none"> -airspeed indicator -artificial horizon (altitude indicator) -altimeter - turn indicator coordinator – relationship between ball and attitude -suction (vacuum) gauge -directional indicator -compass -vertical speed indicator -static ports -pitot tubes -pitot heat. 	<p>Cessna 172 Skyhawk altimeter.</p>
<p>Recognize aircraft reciprocating engine types and comprehension of their operating principles</p> <p>Guiding Question: How is a light fixed wing aircraft powered in flight?</p>	<ol style="list-style-type: none"> 1. Explain the history and development of aircraft reciprocating engines including: <ul style="list-style-type: none"> -inventors -engine types -engine uses -engine limitations 2. Identify and explain reciprocating engines types, configurations and major manufacturers including: <ul style="list-style-type: none"> -rotary -radial -in-line 	<ol style="list-style-type: none"> 1. Demonstrate the ability to identify between engine configurations and types - for example, P&W 985 and Continental O-200 2. Compute reciprocating engine horsepower using the PLANK formula 3. Demonstrate the ability to understand the Otto Cycle by recollecting the 4 strokes and 5 events 4. Delineate the significance of valve overlap.

	Transportation Technology Fundamentals	Transportation Technology Skills
	<ul style="list-style-type: none"> -v-type -horizontally opposed -H-type, Y-type, rotary radial type -water cooled -air cooled -Lycoming -Teledyne Continental <p>3. Explain the operating principles of reciprocating engines including:</p> <ul style="list-style-type: none"> -2 stroke engine -4 stroke engine. 	
<p>Understanding aircraft reciprocating engine components and construction</p> <p>Guiding Question: What are the important parts that make up a fixed wing aircraft reciprocating</p>	<p>1. Recognize and describe internal and external components for horizontally opposed and radial type reciprocating engines including:</p> <ul style="list-style-type: none"> - pistons - piston rings - camshaft - crankshaft - connecting rods - bearings – thrust and plain, pushrods, rockers arms - cam ring - valves - cylinders 	<p>1. Demonstrate proficiency in locating the following parts on a horizontally opposed reciprocating engine:</p> <ul style="list-style-type: none"> -prop shaft -cylinders -baffles -crankcase -oil sump -exhaust -carburetor -throttle cable -magnetos -oil dipstick/filler neck

	Transportation Technology Fundamentals	Transportation Technology Skills
engine?	<ul style="list-style-type: none"> - crankcase - oil sump -exhaust -induction system. 	<ul style="list-style-type: none"> -starter -alternator -tachometer drive -oil filter -fuel filter.
<p>Understanding aircraft reciprocating engine management systems</p> <p>Guiding Question: What controls the operation of a fixed wing aircraft reciprocating engine?</p>	<ol style="list-style-type: none"> 1. Describe the components in reciprocating engine fuel management systems including: <ul style="list-style-type: none"> -fuel types -octane ratings, fuel colour codes and numbering -fuel metering -fuel vaporization -engine power control -fuel/air mixture -float carburetors -pressure carburetors - fuel injection 2. Recognize and describe the parts of engine lubrication management systems including: <ul style="list-style-type: none"> -dry sump -wet sump -tanks -pumps 	<ol style="list-style-type: none"> 1. Perform a visual inspection on a horizontally opposed reciprocating engine in order to identify what the firing order would be including: Lycoming O-320 2. Be able to demonstrate the ability to determine whether a reciprocating engine is outfitted with either a wet sump or dry sump lubricating system 3. Utilizing an aircraft servicing and/or reciprocating engine operating manual determine what type of fuel would be the correct type to be used - for example, Cessna 185 Skywagon outfitted with a Continental IO-520D.

	Transportation Technology Fundamentals	Transportation Technology Skills
	<ul style="list-style-type: none"> -filters -temperature control -pressure type -splash type -oil types - mineral oil, ash less dispersant, synthetic, blends -viscosity <p>3. Describe the parts and functions of engine ignition systems including:</p> <ul style="list-style-type: none"> -battery ignition systems -low tension magnetos -high tension magnetos -electronic ignition systems -ignition harness -spark plugs -battery -starter -firing order -engine timing -generators -alternators. 	
Understanding aircraft reciprocating	1. Identify and describe the principles of engine instruments and controls relating to fuel and lubrication systems including:	1. Demonstrate the ability to identify various reciprocating engine operation instruments in the cockpit - for example, Cessna 150 oil pressure

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>engine controls and engine instrument clusters</p> <p>Guiding Question: What cockpit indication equipment is available to the fixed wing aircraft reciprocating engine operator to inform him/her of proper operation?</p>	<ul style="list-style-type: none"> -pressure instruments -temperature gauges -gauges expressed – PSI, BAR -tachometers -flow meters -pressure warning systems - manifold pressure -throttles -fuel/air mixture controls. 	<p>gauge.</p>
<p>Understanding aircraft reciprocating engine power transfer devices</p> <p>Guiding Question: What are the types of reciprocating engine propellers</p>	<ol style="list-style-type: none"> 1. Examine the classifications of propellers including: <ul style="list-style-type: none"> -pusher type -puller type 2. Describe propeller material types including: <ul style="list-style-type: none"> -wood -metal -composite - material combinations i.e. aluminum bonded 	<ol style="list-style-type: none"> 1. Demonstrate proficiency in determining the functional and physical differences between a pusher type propeller and a puller type propeller including: <ul style="list-style-type: none"> -Piper Seminole PA-44, -Cessna 337 Skymaster 2. Using a light aircraft reciprocating engine service manual, analyze what type of propeller installation method/type is being utilized - for example,

	Transportation Technology Fundamentals	Transportation Technology Skills
and how are they controlled on a fixed wing aircraft?	<p>with wood propellers</p> <p>3. Identify and describe various propeller control configurations including:</p> <ul style="list-style-type: none"> -fixed pitch -adjustable pitch -feathering -reverse pitch -constant speed -governor <p>4. Identification of various configurations of propeller mounting including:</p> <ul style="list-style-type: none"> -tapered shaft -splined shaft -flanged shaft -hub. 	Continental O-360.
<p>Troubleshooting the power train on an aircraft reciprocating engine</p> <p>Guiding Question: What would cause</p>	<p>1. Discuss propeller vibrations - their causes and rectifications including:</p> <ul style="list-style-type: none"> -correctable vibrations -track and balance -static balance -dynamic balance -sound and vibration relationship 	<p>1. Perform a propeller blade integrity inspection as per the aircraft manufacturer's service manual - for example, Cessna 310G.</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
a reciprocating engine propeller to vibrate and how can I repair it on a fixed wing aircraft?	<p>2. Identify and discuss propeller repairs including:</p> <ul style="list-style-type: none"> -repairable damage -non-repairable damage <p>3. Identify and recognize various engine vibration causing issues including:</p> <ul style="list-style-type: none"> -valve timing -magnetos -crankshaft balance -fuel -ice -wear -impact. 	
<p>Understanding light aircraft electrical systems, circuits and components</p> <p>Guiding Question: How does electricity factor in to light fixed wing</p>	<p>DC</p> <p>1. Explain atomic theory and static electricity - DC including:</p> <ul style="list-style-type: none"> -electron theory -electrostatics -voltage <p>2. Explain electrical circuits including:</p> <ul style="list-style-type: none"> -Ohm's Law -resistors 	<p>DC</p> <p>1. Utilizing Ohm's Law solve variety of series and parallel circuit problems</p> <p>2. Use a variety of meters to measure current, voltage, resistance</p> <p>3. Measure values to substantiate Ohm's Law including: ammeter, voltmeter, ohmmeter, multimeter, oscilloscope</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
aircraft operation?	<p>3. Explain electrical measuring devices including: -measuring devices including: -ohmmeter, multimeter/oscilloscope</p> <p>4. Explain batteries -for example, -voltaic cells -cell types -lead acid battery -nickel-cadmium battery -sealed battery -gel battery</p> <p>5. Explain electro-magnetic induction including: -magnetism -magnetic devices -electro-magnetic induction -bonding EMI/RFI suppression -static and composite materials</p> <p>6. Explain DC generators including: -DC generator theory -DC generator controls -DC generator maintenance -voltage control</p>	<p>4. Service, charge and maintain a lead acid battery</p> <p>5. Measure lead acid battery output under loaded and non-loaded conditions</p> <p>6. Operate and test switches, relays, circuit breakers and fuses</p> <p>7. Demonstrate the safe use of a multimeter</p> <p>AC</p> <p>1. Demonstrate proficiency in measuring AC voltages including: oscilloscope, AC voltmeter</p> <p>2. Perform the measurement of capacitance including: digital volt meter</p> <p>3. Convert AC to DC including diode bridge</p> <p>4. Connect and disconnect a power supply to an aircraft as per service manual instructions - for example, external battery cart, ground power unit.</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
	<p>7. Explain alternators including: -relationship of DC power and alternators</p> <p>8. Explain electrical control devices and semi-conductors including: -switches -circuit protection including circuit breakers, fuses (types) -semi-conductors</p> <p><u>AC</u></p> <p>1. Explain principles of AC including: -define AC -frequency -phase -use of oscilloscope</p> <p>2. Explain capacitance including: -define capacitance -capacitors -poly phase AC circuits</p> <p>3. Explain inductance including: -define inductance -inductance coils -transformers</p>	

	Transportation Technology Fundamentals	Transportation Technology Skills
	<p>4. Explain resonance and impedance including:</p> <ul style="list-style-type: none"> -define resonance -define impedance -phase angle and power factor <p>5. Explain 3 phase - 400/115 including:</p> <ul style="list-style-type: none"> -AC generator theory -differences between alternators and generators -transformer rectifiers <p>6. Explain generator and alternator control including:</p> <ul style="list-style-type: none"> -voltage regulation <p>7. Explain power conversion including:</p> <ul style="list-style-type: none"> -DC to AC -AC to DC -AC to AC - voltage change <p>8. Explain AC motors including:</p> <ul style="list-style-type: none"> -theory and components -repulsion motors -synchronous motors -motor losses -single and 3-phase AC motors -brush types 	

	Transportation Technology Fundamentals	Transportation Technology Skills
	-brush wear.	
<p>Understanding aircraft landing gear systems and major components</p> <p>Guiding Question: What are the important parts that make up a light fixed wing aircraft landing gear?</p>	<p>1. Identify and describe landing gear types, configurations and major components including:</p> <ul style="list-style-type: none"> -tricycle -conventional -skis -float planes -amphibious -flying boats -fixed -retractable -non-shock absorbing -shock absorbing <p>2. Discuss aircraft wheel assemblies including:</p> <ul style="list-style-type: none"> -tire types and materials -solid wheels -split wheels -bearing types 	<p>1. Demonstrate proficiency in chocking and jacking aircraft - for example, Piper Aztec PA-23</p> <p>2. Inspect an aircraft tire for integrity as per a service manual - for example, Beechcraft King Air B100</p> <p>3. Perform the bleeding of aircraft brakes - for example, Cessna 150</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
	<p>3. Identify aircraft brake types including:</p> <ul style="list-style-type: none"> -single disk -multi-disk -hydraulic fluid types -anti-skid. 	
<p>Identifying light aircraft airframe types and construction materials</p> <p>Guiding Question: What types of construction designs and materials go into building a light fixed wing aircraft?</p>	<p>1. Identify aircraft fuselage construction including:</p> <ul style="list-style-type: none"> -truss - Pratt, Warren -semi-monocoque -monocoque -sandwich construction. <p>2. Explain and discuss various types of materials used to build light aircraft including:</p> <ul style="list-style-type: none"> -sheet metal -steel tube -aluminum -wood -fabric -advanced Composite. 	<p>1. Perform the identification of various aircraft construction types and materials used including:</p> <ul style="list-style-type: none"> -Piper PA-31 Navajo -Beechcraft Musketeer -Diamond Aircraft DA20 -Piper Super Cub PA-18
<p>Understanding the role of the Canadian Aviation</p>	<p>1. Examine these areas in the Canadian Aviation Regulations relating to light aircraft modification including:</p> <ul style="list-style-type: none"> -certificate of airworthiness 	<p>1. Be able to demonstrate the ability to e-navigate the Canadian Aviation Regulations to find the differences between a major modification of an aircraft and the minor modification of an aircraft?</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>Regulations in respect to modifying aircraft</p> <p>Guiding Question: What rules must be followed if a modification is to be accomplished on a light fixed wing aircraft?</p>	<ul style="list-style-type: none"> -type approval -type certificate -airworthiness directive -service bulletin -supplemental type certificate -limited supplemental type certificate -parts classifications -major modification -minor modification -reporting of modifications -approvals types. 	<p>2. Be able to demonstrate the ability to e-navigate the Canadian Aviation Regulations to find the definition of Form 337</p>
<p>Technological literacy / numeracy</p> <p>Guiding Question: What type of manuals, documents, reports and mathematical formulas and calculations can be expected to be utilized when</p>	<ol style="list-style-type: none"> 1. Identify and understand the typical types of manuals in use in an aircraft maintenance organization in Canada including: <ul style="list-style-type: none"> -Maintenance Manual -Structural Repair Manual -Wiring Diagram Manual -ATA codes 2. Documents that an aircraft maintenance person would typically use in performing their task including: <ul style="list-style-type: none"> -work order -task card 	<ol style="list-style-type: none"> 1. Demonstrate proficiency in using the ATA 100 numbering index system - for example, Aircraft Maintenance Manual section on hydraulics (29) 2. Be able to demonstrate the ability to e-navigate the Canadian Aviation Regulations to find what two methods are acceptable for an aircraft maintenance person to send Transport Canada a Service Difficulty Report?

	Transportation Technology Fundamentals	Transportation Technology Skills
performing maintenance on a light fixed wing aircraft?	<ul style="list-style-type: none"> -maintenance logbook 3. Reports and forms that would be utilized by an aviation maintenance person including: <ul style="list-style-type: none"> -Transport Canada Service Difficulty Report -FAA 337 4. Examine typical mathematical formulas, measurements and concepts to be used by an aircraft maintenance person including: <ul style="list-style-type: none"> -decimal to inches equivalents -metric to inches (vice-versa) -C to F to K (vice-versa) -fundamental equation for lift -fundamental equation for drag -definitions of aspect chord -work and power calculations -standard day atmospheric conditions -Boyle's Law -Charle's Law -Dalton's Law -engine bore and stroke formulas -Ohm's Law. 	
Design process / solving repair	1. Examine these areas in the Canadian Aviation Regulations relating to light aircraft design	1. Be able to demonstrate the ability to e-navigate the Canadian Aviation Regulations to find the

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>challenges</p> <p>Guiding Question: What steps must be followed by a manufacturer of a new type of fixed wing aircraft if it is to be flown in Canadian airspace?</p>	<p>processes including:</p> <ul style="list-style-type: none"> -type design -type approval -type certificate -certificate of registration -certificate of airworthiness - import/export -bi-lateral agreements. 	<p>definition of certificate of airworthiness and TCDS</p> <p>2. Be able to demonstrate the ability to e-navigate through the FAA website</p>
<p>Tools, equipment, and materials</p> <p>Guiding Question: What types of tools is used to fix and maintain a light fixed wing aircraft?</p>	<p>1. Examine hand and machine cutting tools and usage including:</p> <ul style="list-style-type: none"> -diagonal cutters -chisels -hack saws -files -twist drills -countersinks -counter bores -reamers -taps and dies -metal snips -hole cutters <p>2. Explain hand and machine mechanical and</p>	<p>1. Demonstrate the correct tool selection, cotter pin size selection and installation of a cotter pin - for example, AN380 cotter pin and an AN4-4 bolt with an AN310 nut and AN960 washers</p> <p>2. Calculate the correct torque value required to install aircraft hardware - for example, use standard torque chart and install an AN3-3A bolt using an AN365 nut and AN960 washers</p> <p>3. Perform the correct tool selection, methods of rivet selection and installation of a solid rivet - for example, attach 2 pieces of 2024T3 aluminum .040" thick</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
	<p>electrical assembly tools and usage including:</p> <ul style="list-style-type: none"> -wrenches for example, open-end -sockets -torque wrenches -screw drivers -pliers <p>3. Explain power and abrasive tools and usage including:</p> <ul style="list-style-type: none"> -band saws -drill presses -routers -belt sanders -grinders <p>4. Explain sheet metal tools and usage including:</p> <ul style="list-style-type: none"> -hammers -tin snips -rivet guns -bucking bars -nibblers -rivet squeeze -clecos -dimpler -hand drills -river shaver 	<p>4. Demonstrate proficiency in using precision measuring tools - for example, various aircraft part measurements using</p> <ul style="list-style-type: none"> -micrometers -dial calipers

	Transportation Technology Fundamentals	Transportation Technology Skills
	<ul style="list-style-type: none"> -punches -cutting shear -bending brakes -forming machines <p>5. Explain precision measuring tools and devices and usage including:</p> <ul style="list-style-type: none"> -micrometers -calipers. 	
<p>Transportation technology and the environment</p> <p>Guiding Question: What ways are fixed wing aircraft being designed today that is helping to sustain a healthy environment?</p>	<p>1. Explain aircraft weight and drag concerns - savings of fuel use including:</p> <ul style="list-style-type: none"> -advanced composite materials -aerodynamic designs -B787 -A380 -blended wing design -winglets -shark skin aircraft surface treatment – nanotechnology <p>2. Explain the positive effects on the environment of newly designed paints for aircraft including:</p> <ul style="list-style-type: none"> -low VOC paints 	<p>1. Perform a study and develop a report on “green” jet fuel (bio-fuel) - for example, Solajet</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
	<ul style="list-style-type: none"> -removal of chromate from paints -"enviro" paint stripping systems <p>3. Identify more efficient and environmentally friendly reciprocating engines and fuels including:</p> <ul style="list-style-type: none"> -Wankel engine -Austro Engines - AE300 turbo diesel (Diamond Aircraft) -Low Lead fuels -Fuel blends - low emissions with new fuel additives. 	
<p>Transportation technology and society</p> <p>Guiding Question: What new types of fixed wing aircraft and aircraft components are being designed for use today and in the future?</p>	<p>1. Understand new aircraft being designed for future use including:</p> <ul style="list-style-type: none"> -Solar Challenger -Solar Impulse -NASA Pathfinder -UAV -Steeper climbing aircraft -Flying Wing -NASA NX-3 -MIT D-8 -BOEING Sugar Volt 	<p>1. Perform a study and develop a report of the Boeing Subsonic Ultra Green Aircraft Research project (SUGAR)</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>Health and Safety</p> <p>Guiding Question: What types of information, training and equipment must an individual have to conduct themselves in a safe manner around light fixed wing aircraft?</p>	<p>1. Explain and understand WHMIS in Canada including:</p> <ul style="list-style-type: none"> -WHMIS is mandatory training -worker and employer responsibilities -hazard symbols -personal protective equipment -labels -OHSA <p>2. Explain MSDS including:</p> <ul style="list-style-type: none"> -purpose of material safety data sheets -responsibilities of suppliers, employers and workers -information found in MSDS -review every 3 years <p>3. Understanding of other safety training related to the aviation workplace including:</p> <ul style="list-style-type: none"> -transportation of dangerous goods training -fall arrest systems training -confined spaces training -first aid training -CPR training -AED training -fire extinguishing training 	<p>1. Determine the three reasons that would necessitate the application of a workplace label onto a container?</p> <p>2. Be able to demonstrate the ability to e-navigate the Canadian Centre for Occupational Health and Safety to find a description of the WHMIS eight hazard symbols</p> <p>3. Demonstrate the ability to make the correct selection of safety footwear - for example, CSA</p> <p>4. Create a workplace label for a given product - for example, acetone</p>

	Transportation Technology Fundamentals	Transportation Technology Skills
<p>Career opportunities</p> <p>Guiding Question: What types of jobs can an individual expect to find if they choose to work in the aviation field?</p>	<p>1. Explain and understand the wide variety of job opportunities in aviation including:</p> <ul style="list-style-type: none"> -pilot -aircraft maintenance engineer - M,E,S categories -Transport Canada inspector -flight attendant -aircraft servicing attendant -flight operations -air traffic control -maintenance planner -aircraft manufacturer -aircraft maintenance instructor -aircraft flight instructor 	<p>1. Demonstrate the ability to analyze various aviation industry job profiles - for example,</p> <ul style="list-style-type: none"> -pilot -aircraft maintenance -flight attendant -air traffic control <p>2. Demonstrate proficiency in answering competency-based questions on an application and during an interview for an aviation industry position - for example,</p> <ul style="list-style-type: none"> -“Give an example of a situation where you had to take on some additional responsibility?” <p>3. Complete a resume and cover letter to apply for a job specifically in the aviation industry.</p>

Appendix 1

The *Ethical Standards for the Teaching Profession*

The *Ethical Standards for the Teaching Profession* represent a vision of professional practice. At the heart of a strong and effective teaching profession is a commitment to students and their learning. Members of the Ontario College of Teachers, in their position of trust, demonstrate responsibility in their relationships with students, parents, guardians, colleagues, educational partners, other professionals, the environment and the public.

The Purposes of the Ethical Standards for the Teaching Profession are:

- to inspire members to reflect and uphold the honour and dignity of the teaching profession
- to identify the ethical responsibilities and commitments in the teaching profession
- to guide ethical decisions and actions in the teaching profession
- to promote public trust and confidence in the teaching profession.

The Ethical Standards for the Teaching Profession are:

Care

The ethical standard of *Care* includes compassion, acceptance, interest and insight for developing students' potential. Members express their commitment to students' well-being and learning through positive influence, professional judgment and empathy in practice.

Respect

Intrinsic to the ethical standard of *Respect* are trust and fair-mindedness. Members honour human dignity, emotional wellness and cognitive development. In their professional practice, they model respect for spiritual and cultural values, social justice,

confidentiality, freedom, democracy and the environment.

Trust

The ethical standard of *Trust* embodies fairness, openness and honesty. Members' professional relationships with students, colleagues, parents, guardians and the public are based on trust.

Integrity

Honesty, reliability and moral action are embodied in the ethical standard of *Integrity*. Continual reflection assists members in exercising integrity in their professional commitments and responsibilities.

The Standards of Practice for the Teaching Profession

The *Standards of Practice for the Teaching Profession* provide a framework of principles that describes the knowledge, skills, and values inherent in Ontario's teaching profession. These standards articulate the goals and aspirations of the profession. These standards convey a collective vision of professionalism that guides the daily practices of members of the Ontario College of Teachers.

The Purposes of the Standards of Practice for the Teaching Profession are:

- to inspire a shared vision for the teaching profession
- to identify the values, knowledge and skills that are distinctive to the teaching profession
- to guide the professional judgment and actions of the teaching profession
- to promote a common language that fosters an understanding of what it means to be a member of the teaching profession.

The Standards of Practice for the Teaching Profession are:

Commitment to Students and Student Learning

Members are dedicated in their care and commitment to students. They treat students equitably and with respect and are sensitive to factors that influence individual student learning. Members facilitate the development of students as contributing citizens of Canadian society.

Professional Knowledge

Members strive to be current in their professional knowledge and recognize its relationship to practice. They understand and reflect on student development, learning theory, pedagogy, curriculum, ethics, educational research and related policies and legislation to inform professional judgment in practice.

Professional Practice

Members apply professional knowledge and experience to promote student learning. They use appropriate pedagogy, assessment and evaluation,

resources and technology in planning for and responding to the needs of individual students and learning communities.

Members refine their professional practice through ongoing inquiry, dialogue and reflection.

Leadership in Learning Communities

Members promote and participate in the creation of collaborative, safe and supportive learning communities. They recognize their shared responsibilities and their leadership roles in order to facilitate student success. Members maintain and uphold the principles of the ethical standards in these learning communities.

Ongoing Professional Learning

Members recognize that a commitment to ongoing professional learning is integral to effective practice and to student learning. Professional practice and self-directed learning are informed by experience, research, collaboration and knowledge.