Ontario College of Teachers
Ordre des enseignantes et des enseignants de l'Ontario

Additional Qualification Course Guideline Honour Specialist Physics

Schedule E – Teachers' Qualifications Regulation

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Cette publication est également disponible en français sous le titre de *Spécialiste en études supérieures en physique.*

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Preface

Additional Qualification (AQ) course guidelines are designed following extensive consultation and feedback from course providers, course writers and members of the teaching profession.

AQ course guidelines serve as the framework for providers and instructors to develop courses.

AQ course guidelines are organized in the following two sections:

Section A: Additional Qualification Course Foundations

This section outlines the fundamental contexts that are embedded in the content of the AQ course. Education in Ontario embodies these to support educator and learner well-being. These fundamental contexts are essential to foster safe, welcoming and inclusive learning environments for all learners and educators.

Section B: Additional Qualification Course Design

This section identifies the core concepts and related elements that are accreditation requirements for all AQ courses. This section also outlines specific content that allows educators to gain in-depth knowledge and skills related to the AQ course.

In this document, all references to candidates are to educators enrolled in the AQ course. References to learners indicate those enrolled in school programs.

Introduction

The Ontario College of Teachers (the College) is the self-regulating body for the teaching profession in Ontario and is responsible for:

- establishing and enforcing professional standards and ethical standards applicable to members of the College
- providing for the ongoing education of members of the College
- accrediting Additional Qualification (AQ) courses.

The College supports teaching excellence by preparing educators to work in varied and diverse educational contexts and geographical settings:

- English language public school
- French language public school
- English language Catholic school
- French language Catholic school
- First Nations school
- Provincial and Demonstration school
- Private school
- Independent school
- Urban setting
- Rural setting
- Remote setting.

This AQ course guideline provides a framework upon which to develop courses that meet accreditation requirements established in Regulation.

Section A: Additional Qualification Course Foundations

Placing each student's interests and well-being first is at the core of teaching in Ontario.

Professional Learning in Ontario

Professional learning is an integral part of the teaching profession. Educators participate in ongoing professional learning with the goal of improving outcomes for Ontario learners.

Educators complete a four-semester, pre-service teacher education program to become qualified to teach in Ontario. Throughout their career, they continue to engage in professional learning offered in various formats such as sessions offered by Ministry of Education, School Board or community partners, professional reading and Additional Qualification (AQ) courses.

The AQ Course *Honour Specialist Physics* reflects **adult learning theories and processes** that foster critical reflection, dialogue and inquiry. Instructors provide candidates with professional learning experiences related to teaching, learning and assessment of learners.

AQ courses are designed by educators to inform and enhance professional practice. These courses allow educators to deepen their knowledge and skills in design and delivery of specific programs. They also support professional practice by preparing educators for specific roles within the educational community.

Professional Learning Framework for the Teaching Profession

The *Professional Learning Framework for the Teaching Profession* describes opportunities and processes that support ongoing professional learning for educators. AQ courses offer an opportunity for educators to inform and advance their professional knowledge, skills, practices and values.

Ethical Standards for the Teaching Profession

Standards of Practice for the Teaching Profession

Standards based resources can be found on the College web site.

Ontario's Learning Context

Ontario educators recognize that learning is influenced by the individual student's strengths, needs, interests, lived experiences and identities. Education in Ontario is complex and dynamic. Ontario's schools are learning communities that reflect the province's diversity. The *Ontario Human Rights Code* and the *Education Act* serve as the foundation for equitable, inclusive and accessible education.

The teaching profession in Ontario continues to evolve in response to the current and everchanging diversity of learners. Thus, educators are called upon to follow foundational principles that inform instructional practice. Through ongoing professional learning, educators deepen their understanding of the principles outlined below. In so doing, Ontario educators enhance their professional practice to support each student's learning and well-being.

Anti-Oppression Foundation

An anti-oppression foundation is an approach that supports ensuring that equity and human rights are foundational to all Additional Qualification (AQ) courses and programs available to Ontario educators. An anti-oppression foundation acknowledges that systemic manifestations of power and privilege have led to multiple forms of oppression, injustices, inequities and inequalities. Ongoing teacher education must recognize and address historical contexts which have contributed to various forms of oppression. An anti-oppression foundation recognizes that educator and student learning and well-being are impacted by biases and assumptions related to power and privilege. Educators have a shared ethical and professional responsibility to identify and challenge individual and systemic barriers to support the learning, well-being and inclusion of each learner.

Indigenous Histories, Cultures, Perspectives, and Knowledge Systems in Education

Ontario's educators are responsible to uphold the *Truth and Reconciliation Commission of Canada: Calls to Action* and align their professional practice with the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP). They engage in authentic reconciliatory action by exploring and integrating First Nations, Métis, and Inuit histories, perspectives and knowledge systems, in teaching and learning. Educators, as treaty partners, acknowledge that conversation and collaboration with Indigenous communities will guide them on the reconciliation journey.

Aménagement Linguistique Policy (PAL)

Section 23 of the Canadian Charter of Rights and Freedoms guarantees the French or English linguistic minority populations of a province the right to instruction in their own language.

In Ontario, the *Aménagement Linguistique Policy* (PAL) outlines the unique mandate of French-Language schools. Educators act as ambassadors and model the French language and francophone culture for learners. Educators deepen their understanding of learners' linguistic and cultural francophone identity. They collectively develop a provincial, national and international sense of belonging to *la Francophonie*.

Learning for All

Educators believe that each student can learn. Educators provide programs and services that respond to each learner's unique strengths and needs. Evidence-based teaching and learning practices that are learner-centred provide equitable opportunities for all. Inclusive learning environments respect the identities of each learner and support their cognitive, social, emotional and physical development.

Accessibility for All

Accessibility for all is informed by the *Ontario Human Rights Code* and the *Accessibility of Ontarians with Disabilities Act*, 2005. Accessibility, inclusion and equity are fundamental to everyday practice for teaching and learning. Educators advocate for each learner to access and benefit from services and resources within the education system, understanding the unique needs presented by geographical and socioeconomic contexts. Educators design opportunities for each learner to showcase their abilities and fully participate in their learning. The implementation of adaptive strategies, such as assistive technology, accessible content and inclusive design for teaching and learning respects the strengths and needs of each learner.

Special Education

Each learner has their own unique profile. Under the *Education Act*, a learner may be identified by an Identification, Placement and Review Committee (IPRC) as having behavioural, communicational, intellectual, physical or multiple exceptionalities. An Individual Education Plan (IEP) must be developed by an interdisciplinary team to reflect the learner's strengths, needs, and abilities, according to Reg. 181/98. As educators are responsible for instruction, assessment and evaluation of all learners, they provide accommodations, modifications, or alternative programming outlined in the IEP.

Accreditation – Program of Additional Qualification

Accreditation requirements for Additional Qualification (AQ) courses are articulated in O. Reg. 347/02: *Accreditation of Teacher Education Programs*, s. 24.

A program of additional qualification may be granted accreditation under this Regulation if the following requirements are satisfied:

1. 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.
2. The program satisfies the requirements of the teachers' qualifications regulation for entry of an additional qualification on the general certificate of qualification and registration of a person who successfully completes the program.
3. The program curriculum is current, references the Ontario curriculum, relevant legislation and government policies and represents a wide knowledge base in the program's area of study.
4. The course content of the program makes appropriate provision for the application of theory in practice.
5. The program's format and structure are appropriate for the course content of the program.

5.1 The program consists of a minimum of 125 hours of work acceptable to the Registrar.

6. There is clear identification of the goals of the program, with a formal testing or assessment mechanism to determine the level of successful completion of the program.
7. The majority of the educators teaching the program have Ontario teaching experience relevant to the program.
8. The provider maintains adequate internal controls to preserve the integrity of student records relating to the program.
9. The provider is committed to continuous improvement and quality assurance of the program and, if the program is an existing program, has implemented measures demonstrating that commitment.

O. Reg. 347/02, s. 24; 2009, c. 33, Sched. 13, s. 3 (2); O. Reg. 182/10, s. 8.

Section B: Additional Qualification Course Design

Additional Qualifications (AQs) for educators are identified in O. Reg. 176/10: *Teachers' Qualifications Regulation*. This regulation includes courses that lead to AQs, the Principal's Development Qualification, the Principal's Qualifications, the Primary Division, the Junior Division, the Intermediate Division, the Senior Division, the Supervisory Officer's Development Qualification and the Supervisory Officer's Qualifications. A session of a course leading to an AQ shall consist of a minimum of 125 hours as approved by the Registrar. Successful completion of the course is recorded on the candidate's Certificate of Qualification and Registration.

Honour Specialist Additional Qualification – Schedule E (Single Session)

Schedule E (see Appendix 1) *Honour Specialist Physics* allows educators with post-secondary studies in physics to:

- apply knowledge and skills in a leadership role
- develop the capacity for curriculum leadership.

Additional Qualification Course Requirements

The AQ course *Honour Specialist Physics* enables candidates to advance their professional practice through focussed learning in the following areas:

- Curriculum Knowledge
- Pedagogical Strategies
- The Learning Environment.

This AQ course is designed and delivered using adult learning instructional practices.

The purpose of this AQ course is to support educators in the development of professional knowledge, skills and practices related to the teaching of physics. The course enables educators to explore physics through an anti-oppression foundation that promotes learner curiosity in a safe and inclusive environment. Educators will enhance their understanding of the interconnected themes and the importance of safety in physics.

Honour Specialist Physics applies the subject-specific professional practice, knowledge and skills in a leadership role in the following required elements:

Anti-Oppression Foundation

- theories and pedagogies about multiple forms of oppression applied to the design, assessment and implementation of programs and practices
- addressing individual and systemic biases, discrimination and barriers as well as manifestations of power and privilege
- addressing disproportionate representation of learners from equity seeking groups within specialized programs and within science related careers (for example, underrepresentation of learners with special needs in technology, engineering, arts and math based industries)
- sciences as a process for ongoing critical inquiry and analysis of social concepts
- relationship between science, technology and ethics (for example, use and misuse of science narratives and responsible application of digital and social media).

The Ethical Standards for the Teaching Profession and The Standards of Practice for the Teaching Profession

- significance of the Ethical Standards and the Standards of Practice as theoretical foundations within the AQ Course *Honour Specialist Physics*
- ethical professional identity, knowledge, leadership, advocacy and collective practices to inform program planning
- research in physics aligned with personal professional learning goals (for example, First Nations, Métis, and Inuit knowledge systems, culturally relevant pedagogy and intersectionality of identities)
- educator health and safety training specific to science and technology learning environments
- educator training related to information and communication technologies used in physics, including the scientific experimentation process.

First Nations, Métis, and Inuit histories, perspectives and knowledge systems

- meaningful inclusion of First Nations, Métis, and Inuit histories, perspectives and knowledge systems in teaching and learning processes (for example, land-based education and recognition of Indigenous contributions in the field of physics)
- knowledge of the *Truth and Reconciliation Commission of Canada: Calls to Action* (TRC)
- awareness of *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP)
- relationships with local and national Indigenous communities to broaden perspectives related to physics (for example, use of engineering design process for traditional transportation modes, and knowledge about the connection between space and energy).

Current Ontario curriculum and related Ministry of Education policies, frameworks, guidelines, strategies and resources:

- Ontario curriculum, policies, frameworks, strategies and resources related, including health and safety resources, to *Honour Specialist Physics*
- policies, processes and practices that foster openness to innovation, culturally inclusive pedagogies and the democratization of knowledge
- connections between physics and other disciplines including technology, society, economy, environment and other sciences
- processes and strategies to implement the continuum of physics concepts between grades and courses.

Current Ontario legislation and regulation:

- relevant legislation (for example, *Ontario Human Rights Code, Anti-Racism Act*, 2017, S.O. 2017, c. 15 and *Freedom of Information and Protection of Privacy Act*) and policies at the municipal, provincial, federal and international levels that support human rights and privacy for all
- candidates' legal obligations and ethical responsibilities according to current provincial legislation, policies and practices
- legal and ethical responsibilities related to health and safety legislation, regulations and standards in physics (for example, Occupational Health and Safety Act [OHSA] and Workplace Hazardous Materials Information System [WHMIS]) and other Ministry of Labour, Immigration, Training and Skills Development standards and guidelines within the physics learning environment
- policies, procedures and skills to ensure safe practices in the use of equipment, tools, materials and technology during hands-on and online learning opportunities
- risk-management policies and safety protocols related to the maintenance, care and handling of materials used in the study of physics.

Learning for All

- processes and program planning that provide equitable opportunities for each learner
- strategies that respond to the strengths, identities, needs and interests of each learner (for example, differentiated instruction, universal learning design and experiential learning)
- practices to understand learner curiosity and experiences to empower them to reach their learning goals (for example, open and guided inquiry and critical thinking)
- principles of systems thinking for independent and interconnected systems that facilitate learning physics

- indoor and outdoor experiential learning activities to explore physics
- strategies to foster learner confidence, resilience and engagement in learning physics (for example, real-world connections to physics).

Accessibility for All

- ethical responsibilities related to the *Ontario Human Rights Code* and *Accessibility for Ontarians with Disabilities Act* S.O., 2005
- advocacy for resources and services that respond to the cognitive, social, emotional, physical and contextual needs of each learner
- adaptive strategies, assistive supports and technologies to facilitate learning and foster inclusion
- strategies to address ableism that exists in processes and practices (for example, adoption of innovative design based on learner's abilities)
- strategies to understand and plan for visible and invisible barriers to learner participation (for example, cultural beliefs, food insecurity and allergies).

Special Education

- ethical responsibilities related to learner's Individual Education Plan (IEP), safety plan and transition plan
- programs, strategies and services that support the identified learner in achieving individual goals outlined in their respective plans
- interdisciplinary teams to support learning, advocacy and transitions
- accommodations and modifications that facilitate access to physics for each learner (for example, sensory, environmental and physical).

Educational research

- current research and literature associated with professional practices, policies and pedagogies related to *Honour Specialist Physics* (for example, ethics in physics, scientific experimentation and engineering design processes)
- research that reflects society's diverse changing nature and influence on learning and well-being
- theoretical foundation for the design, assessment and implementation of programs and practices in support of learning, including scientific and technological literacy (for example, cross-curricular and interdisciplinary approaches to teaching, and scientific methodologies and processes)
- research on cognitive science and brain development to guide the teaching of physics
- research related to literacy in physics

- research on emerging technologies that facilitate teaching and learning physics (for example, ethical and responsible use of Artificial Intelligence [AI] and coding)
- research and contributions of physicists, representative of diverse voices and cultures
- global and local influences, leaders and role models in physics (for example, youth role models as innovators, entrepreneurs and problem-solvers).

Application of theories of learning and teaching

- theories and practices related to pedagogy and andragogy that support learning within an inclusive environment (for example, advances in neurosciences, and how outdoor, flexible and alternative learning environments support science and technology education)
- theoretical frameworks and fundamental principles underpinning *Honour Specialist Physics* (for example, methodologies of analytical thinking and computational thinking)
- theories of development and identity formation that support learner well-being, efficacy and agency
- learning theories to develop learner's profiles and identities
- research related to experiential learning and its impact on teaching and learning physics
- theories related to the interdependence and interconnections of themes in physics
- theories related to learner led and educator guided inquiry, including scientific experimentation and engineer design processes, within physics.

Supports for learners

- policies, processes, practices to support learners cognitive, social, emotional and physical development (for example, experiential learning and making real world connections in physics and technology)
- programs that respond to learners' lived experiences, identities, needs and well-being (for example, trauma-informed pedagogy and resources)
- processes, strategies and practices that respond to linguistic abilities of learners (for example, teaching of science vocabulary and scientific terminology, and glossary of physics terms and formulas)
- critical pedagogies, strategies and practices that support learners' well-being and efficacy (for example, addressing math anxiety and stereotypes in physics)
- processes and strategies that respond to multiple entry points and demonstration of learning.

Teaching, assessing and evaluating

- interdisciplinary and cross-curricular program design and implementation that align with the principles and processes of Ontario curriculum and related policies (for example, STEM/STEAM)
- assessment and evaluation processes and practices to:
    - provide feedback to learners and adjust instruction (assessment *for* learning)
    - develop learners' capacity to be independent, autonomous learners (assessment *as* learning)
    - make informed professional judgments about the quality of learning (assessment *of* learning)
- instructional strategies to emphasize the importance of inquiry-based learning, STEM investigation and communication skills and transferable skills (for example, critical thinking, scientific process, creativity, problem-solving and innovation and engineering design process)
- processes for safe use of technology, hand tools, lab equipment and learning materials
- scientific and engineering design processes for the investigation of content, practices and applications in physics (for example, misconceptions, conceptual changes and the nature of science)
- strategies for practical application of science and technology concepts within *Honour Specialist Physics* to engage learners (for example, field study, demonstrations, experiential learning, labs and problem-based learning)
- integration of mathematical concepts and literacy strategies to develop learners' scientific literacy skills and competencies (for example, food literacy, coding and robotics)
- program planning that integrates scientific inquiry and experiential learning opportunities (for example, experimentation, research, trial and error, exploitation, designing, building, testing and technological problem-solving)
- lab design that promotes collaboration, develops computational thinking skills and provides varied opportunities to demonstrate learning
- planning, including budget allocation for the purchase of resources, equipment and tools to teach physics (for example, developing grants and proposals)
- continuum of learner skill development in physics.

Pathway and transition planning

- processes and practices to support all transitions
- curriculum design using learners' career and life goals
- programs and learning opportunities that value each pathway equally and equitably (for example, interviewing people in traditional and non-traditional physics careers)

- practices that develop the transferable skills to support lifelong learning and the foundational technological skills related to current and emerging careers in the physics sector
- advocacy for physics as an entry point to all career pathways (for example, plumber, electrician, geophysicist and cosmologist)
- strategies to disrupt stereotypes within science related careers by introducing diverse career opportunities to all learners.

Safe, equitable and inclusive learning environments

- policies and processes to create and maintain inclusive learning environments that respect diversity and encourage critical thinking (for example, gender neutral language and resources in various formats)
- inclusive learning environments that facilitate learning, foster learner agency and perspectives
- practices that support safe and healthy learning environments for learners as well as families, caregivers, guardians, Elders, Knowledge Keepers and Knowledge Guardians
- learning environment as the third teacher to promote curiosity, creativity, voice, perspectives and learner-led inquiry.

Teaching and learning through e-Learning principles

- practices for the integration of information and communication technologies to enhance teaching and learning (for example, digital recordings of laboratory findings, simulations, online labs and virtual reality tours)
- technological and communication resources to enhance professional knowledge in support of learning and agency
- ethical use of technology in support of learners' safety, privacy and well-being (for example, appropriate use of AI and modelling online etiquette)
- health and safety considerations for teaching physics within a virtual learning environment (for example, impacts of screen time, use of tools and materials to build prototypes).

Culturally responsive and relevant pedagogical practices

- culturally inclusive processes and practices to provide learning opportunities that respect the learning styles, voices, perspectives, diverse identities and lived experiences of each learner
- culturally inclusive resources that reflect diverse modalities and populations to support of learner engagement and well-being
- awareness of differences between cultural appropriation and cultural appreciation
- inclusion of cultural referents related to physics and technology advances and examples of engineering design process.

Social justice and democratic citizenship

- policies related to democratic citizenship within local, national and global contexts
- processes and practices that foster learners' voice and choice, respect diversity and develop advocacy skills to promote social justice (for example, learning opportunities within the community and exploration of intersectionality within physics and technology)
- strategies for consensus-building, participatory democracy and empowerment within schools and the community
- principles of ethical, social and legal implications in physics (for example, connection between green industries, combating climate change, addressing inequities in project design processes, and access to internet).

Environmental sustainability

- shared responsibility and partnership to foster ecological justice
- integration of environmentally sustainable policies, pedagogies and practices (for example, safe disposal policies and application of the three R's within project planning)
- processes that engage learners as active global citizens in supporting environmental and economic sustainability on a local, national and global level
- integration of First Nations, Métis, and Inuit ecological perspectives and environmental knowledges in teaching physics
- physics advancements and their impact on environmental sustainability (for example, nuclear energy, renewable energy and fossil fuels)
- strategies and practices used to enhance sustainability and reduce harmful environmental effects, including impact of human activities on the environment
- experiential learning opportunities in science and technology and the impacts on the environment, economics, and health (for example, robots, prototypes, AI, renewable energy and approaches to agriculture and harvesting).

Shared responsibility for learning

- processes and practices to foster communication and collaboration with learners, families, caregivers, guardians, Elders, Knowledge Keepers and Knowledge Guardians, agencies and the school community to support learning
- partnerships with families, caregivers, guardians, Elders, Knowledge Keepers and Knowledge Guardians that value shared decision-making, confidentiality, advocacy and leadership
- partnerships with community and post-secondary education institutions to provide learning opportunities and support physics program design, planning and implementation (for example, field trips, mentors, in-class supports, access to equipment and virtual or in-person STEM activities).

Communities of professional learning

- professional learning communities that promote critical pedagogy and collective efficacy
- research and leadership to advance professional practice through ongoing collaborative inquiry, dialogue and innovation (for example, resources for STEM activities)
- models of mentorship for support of educator engagement in the physics curriculum
- internal and external collaboration and supports to enhance professional practices in physics, including cross-curricular teams, Board leads, mentors and subject-associations (for example, Ontario Association of Physics Teachers, American Association of Physics Teachers and Science Teachers' Association of Ontario and digital communities).

Resources

Resources to support the development of the AQ Course *Honour Specialist Physics* can be found on the College website and the Ontario Ministry of Education website.

Appendix 1

Schedule E Additional Qualification (AQ) Course – Leadership Components

Leading and Researching

- How do candidates become leaders in the subject area? - Develop leadership skills
- Candidate driven supported by instructor,
- Candidates develop learning goals to bring their knowledge to others
- Analyze pertinent legislation and policies and measure impact at school and system level
- Lead change related to curriculum and policy implementation
- Lead innovation in teaching and learning in the learning context (for example, investigate Standards of Practice, parent/guardian and community engagement strategies, learner identity)
- Develop leadership strategies to further research, theories and frameworks related to subject matter
- Apply leadership strategies and subject content research to lead instructional practice.

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