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REVISED

The Ontario Curriculum
Grades 11 and 12

Technological Education

reach every student

Ontario

CONTENTS

Une publication équivalente est disponible en français sous le titre suivant : *Le curriculum de l'Ontario, 11e et 12e année – Éducation technologique, 2009.*

This publication is available on the Ministry of Education's website, at www.edu.gov.on.ca.

COURSES

INTRODUCTION

This document replaces all but the Computer and Information Science component of *The Ontario Curriculum, Grades 11 and 12: Technological Education, 2000*. Beginning in September 2009, all technological education courses for Grades 11 and 12 will be based on the expectations outlined in this document.

SECONDARY SCHOOLS FOR THE TWENTY-FIRST CENTURY

The goal of Ontario secondary schools is to support high-quality learning while giving individual students the opportunity to choose programs that suit their skills and interests. The updated Ontario curriculum, in combination with a broader range of learning options outside traditional classroom instruction, will enable students to better customize their high school education and improve their prospects for success in school and in life.

THE IMPORTANCE OF TECHNOLOGICAL EDUCATION IN THE CURRICULUM

Technological innovation influences all areas of life, from the daily lives of individuals to the work of business and government, to interactions on a global scale. It helps meet basic human needs and provides tools for improving people's lives and exploring new frontiers. The policy outlined in this document is designed to ensure that technological education in Ontario enables students to meet the challenges and opportunities of the twenty-first century.

The power, reach, and rapid evolution of technology demand a curriculum that will enable students to become technologically literate – that is, able to understand, work with, and benefit from a range of technologies. Students need to acquire the technological skills and knowledge that will allow them to participate fully in a competitive global economy and to become responsible citizens in an environmentally vulnerable world. To succeed in today's society, students need to be effective problem solvers and critical thinkers, able to understand, question, and respond to the implications of technological innovation. Students who pursue careers in technology will also need these high-level skills to develop solutions to technological challenges or to provide the services required in their chosen fields.

Technological education focuses on developing students' ability to work creatively and competently with technologies that are central to their lives. As they proceed through their elementary and secondary school education, students attain a level of technological literacy that will enhance their ability to succeed in their postsecondary studies or in the workplace. For students who do not choose to pursue careers in technology, technological education can provide knowledge and skills that will enhance their daily lives, whether by enabling them to work on home renovations or car repairs or by allowing them to pursue technological hobbies.

Technological education promotes the integration of learning across subject disciplines. For example, when students design a product, they explore the social or human need that the product addresses (social science), the scientific principles involved in its design and construction (science), its dimensions and shape (mathematics), and the aesthetic qualities of its design (the arts). When they assess the impact that new technologies have had – or may have – on society, students are exploring historical or current events. When they consider how various technologies affect health and physical well-being, they are looking into aspects of health and physical education. Students apply business principles to the study of the production and marketing of products. They apply literacy skills to communicate design ideas, produce reports summarizing technological projects, and write instructions for the use of the products they create. Technological education also helps students develop research skills and fosters creativity, critical thinking, and problem solving. In addition, in its emphasis on innovation to meet human needs, it encourages global citizenship and promotes social, economic, and environmental awareness.

Subject matter from any course in technological education can be combined with subject matter from one or more courses in other disciplines to create an interdisciplinary course. The policies and procedures regarding the development of interdisciplinary courses are outlined in the interdisciplinary studies curriculum policy document.

The secondary school technological education curriculum is designed to build on the foundation of knowledge and skills provided by the elementary science and technology curriculum, particularly in its Understanding Structures and Mechanisms strand. In this continuum, there is a similar emphasis on foundational knowledge and skills (fundamentals), technological problem-solving skills and processes, and the relationship between technology, the environment, and society.

THE GOALS OF TECHNOLOGICAL EDUCATION

The fundamental purpose of the technological education program is to provide students with knowledge, skills, and attitudes that will enhance their ability to achieve success in secondary school, the workplace, postsecondary education or training, and daily life.

The goals of the technological education curriculum are to enable students to:

- gain an understanding of the fundamental concepts underlying technological education;
- achieve the level of technological competence they will need in order to succeed in their postsecondary education or training programs or in the workplace;
- develop a creative and flexible approach to problem solving that will help them address challenges in various areas throughout their lives;
- develop the skills, including critical thinking skills, and the knowledge of strategies required to do research, conduct inquiries, and communicate findings accurately, ethically, and effectively;
- develop lifelong learning habits that will help them adapt to technological advances in the changing workplace and world;
- make connections that will help them take advantage of potential postsecondary educational and work opportunities.

THE PHILOSOPHY OF BROAD-BASED TECHNOLOGICAL EDUCATION

The philosophy that underlies broad-based technological education is that *students learn best by doing*. This curriculum therefore adopts an activity-based, project-driven approach that involves students in problem solving as they develop knowledge and skills and gain experience in the technological subject area of their choice.

Rather than focusing on specific occupations, courses in this broad-based technology curriculum explore groups of related occupations and industry sectors within particular subject areas. So, for example, workplace preparation courses in construction technology enable students to acquire knowledge and skills related to carpentry, electrical/network cabling, heating and cooling, masonry, and plumbing.

Broad-based technology courses enable students to develop a variety of transferable skills that will serve them well in a complex and ever-changing workplace. For example, problem-solving skills are transferable skills, because they can be applied in a wide variety of situations to solve problems of various kinds. Other transferable skills emphasized in this curriculum are the "Essential Skills" and work habits identified in the Ontario Skills Passport (see pp. 33–34) as the skills and habits that enable people to perform the tasks required in their jobs and to participate fully in the workplace and the community.

FUNDAMENTAL TECHNOLOGICAL CONCEPTS

This curriculum identifies a number of fundamental concepts that inform design and production in various areas of technology. To address technological challenges and solve problems effectively, students need to take the full range of these concepts and elements of technology into account. As they progress through their technological education courses, students will come to understand these concepts more deeply, and to work with them creatively as they confront new challenges.

Fundamental Concepts	
Aesthetics	The aspects of a product, process, or service that make it pleasing to the human senses.
Control	The means by which a device or process is activated or regulated.
Environmental sustainability	The creation of products or services and use of resources in a way that allows present needs to be met without compromising the ability of future generations to meet their needs. An important related concept is that of *environmental stewardship* – the acceptance of responsibility for the sustainable use and treatment of land and other natural resources.
Ergonomics	The design of a product, process, or service in a way that takes the user's well-being with respect to its use or delivery into account – that is, in a way that minimizes discomfort, risk of injury, and expenditure of energy.
Fabrication/ building/creation	The act or process of assembling components and/or materials and resources to create a product or service.
Function	The use for which a product, process, or service is developed.

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Innovation	Original and creative thinking resulting in the effective design of a product or service.
Material	Any substance or item used in the creation of a product or delivery of a service.
Mechanism	A system of connected parts that allows a product to work or function.
Power and energy	The resource that enables a mechanism to perform work.
Safety	The care and consideration required to ensure that the product, process, or service will not cause harm.
Structure	The essential physical or conceptual parts of a product, process, or service, including the way in which the parts are constructed or organized.
Systems	The combinations of interrelated parts that make up a whole and that may be connected with other systems.

ROLES AND RESPONSIBILITIES IN TECHNOLOGICAL EDUCATION

Students

Students have many responsibilities with regard to their learning. Students who make the effort required to succeed in school and who are able to apply themselves will soon discover that there is a direct relationship between this effort and their achievement, and will therefore be more motivated to work. There will be some students, however, who will find it more difficult to take responsibility for their learning because of special challenges they face. The attention, patience, and encouragement of teachers can be extremely important to the success of these students. However, taking responsibility for their own progress and learning is an important part of education for all students, regardless of their circumstances.

Mastering the concepts and skills connected with technological education requires work, study, and the development of cooperative skills. In addition, students who actively pursue opportunities outside the classroom will extend and enrich their understanding of technology. Their understanding and skills will grow as they engage in recreational activities that involve technology (e.g., model building), reading related to technology (e.g., magazines, Internet sources), and learning about technological advances (e.g., attending technology fairs).

Parents

Parents[1] have an important role to play in supporting student learning. Studies show that students perform better in school if their parents are involved in their education. By becoming familiar with the curriculum, parents can determine what is being taught in the courses their daughters and sons are taking and what they are expected to learn. This awareness will enhance parents' ability to discuss their children's work with them, to communicate with teachers, and to ask relevant questions about their children's progress. Knowledge of the expectations in the various courses will also help parents to interpret teachers' comments on student progress and to work with teachers to improve their children's learning.

1. The word *parents* is used in this document to refer to parent(s) and guardian(s).

Effective ways in which parents can support their children's learning include attending parent–teacher interviews, participating in parent workshops, becoming involved in school council activities (including becoming a school council member), and encouraging students to complete their assignments at home. In addition to supporting regular school activities, parents may wish to provide their daughters and sons with opportunities to question and reflect on current affairs, including news about developments in various areas of technology.

Teachers

Teachers and students have complementary responsibilities. Teachers develop appropriate instructional strategies to help students achieve the curriculum expectations, as well as appropriate methods for assessing and evaluating student learning. Teachers also support students in developing the reading, writing, oral communication, and numeracy skills needed for success in their courses. Teachers bring enthusiasm and varied teaching and assessment approaches to the classroom, addressing different student needs and ensuring sound learning opportunities for every student.

Using a variety of instructional, assessment, and evaluation strategies, teachers provide numerous hands-on opportunities for students to develop and refine their problem-solving skills, critical and creative thinking skills, and communication skills, while discovering fundamental concepts through activities and projects, exploration, and research. The activities offered should enable students to relate and apply these concepts to the social, environmental, and economic conditions and concerns of the world in which they live. Opportunities to relate knowledge and skills to these wider contexts will motivate students to learn in a meaningful way and to become lifelong learners.

Teachers need to help students understand that problem solving of any kind often requires a considerable expenditure of time and energy and a good deal of perseverance. Teachers also need to encourage students to reason, to explore alternative solutions, and to take the risks necessary to become successful problem solvers.

Teachers are also responsible for ensuring the safety of students during classroom activities and for encouraging and motivating students to assume responsibility for their own safety and the safety of others. They must also ensure that students acquire the knowledge and skills needed for safe participation in all technological activities.

Principals

The principal works in partnership with teachers and parents to ensure that each student has access to the best possible educational experience. To support student learning, principals ensure that the Ontario curriculum is being properly implemented in all classrooms using a variety of instructional approaches. They also ensure that appropriate resources are made available for teachers and students. To enhance teaching and learning in all subjects, including technological education, principals promote learning teams and work with teachers to facilitate their participation in professional development activities. Principals are also responsible for ensuring that every student who has an Individual Education Plan (IEP) is receiving the modifications and/or accommodations described in his or her plan – in other words, for ensuring that the IEP is properly developed, implemented, and monitored.

Community Partnerships

Community partners in the area of technological education can be an important resource for schools and students. They can provide support for students in the classroom, and can be models of how the knowledge and skills acquired through the study of the curriculum relate to life beyond school. As mentors, they can enrich not only the educational experience of students, but also the life of the community. Schools can, for example, make arrangements with firms or other groups in the community to provide specialists in various areas and aspects of technology (e.g., engineers, technicians, technologists, tradespeople, or experts in construction, health care services, or green industries) to participate in in-class workshops for students based on topics, concepts, and skills from the curriculum. Such firms or groups may also be interested in working with schools to create opportunities for cooperative education and apprenticeships, in connection with the Ontario Youth Apprenticeship Program (OYAP).

Schools and school boards can play a role by coordinating efforts with community partners. They can involve colleges, universities, trade unions or professional organizations, local businesses, and community volunteers in supporting instruction and in promoting a focus on technological education in and outside the school. Postsecondary institutions and other community stakeholders can be included in events held at the school (such as parent education nights, technology skills competitions, and joint ventures), and school boards can collaborate with their community partners by providing educational opportunities within the community.