2009

REVISED

The Ontario Curriculum
Grades 9 and 10

Technological Education

reach every student

Ontario

Exploring Technologies, Grade 9

Open **TIJ1O**

This course enables students to further explore and develop technological knowledge and skills introduced in the elementary science and technology program. Students will be given the opportunity to design and create products and/or provide services related to the various technological areas or industries, working with a variety of tools, equipment, and software commonly used in industry. Students will develop an awareness of environmental and societal issues, and will begin to explore secondary and postsecondary education and training pathways leading to careers in technology-related fields.

Prerequisite: None

Note: *Schools may offer broad-based courses, using the expectations provided here for Exploring Technologies, that focus on a particular subject area within the technological education curriculum. Brief descriptions for courses in each of the subject areas are given below, along with the course codes assigned to them. For more information about the delivery of such courses, see pages 10–13.*

Exploring Communications Technology (TGJ1O)

This exploratory course introduces students to concepts and skills in communications technology, which encompasses television/video and movie production, radio and audio production, print and graphic communications, photography, and interactive new media and animation. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Computer Technology (TEJ1O)

This exploratory course introduces students to concepts and skills in computer technology, which encompasses computer systems, networking, interfacing, and programming, as well as electronics and robotics. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Construction Technology (TCJ1O)

This exploratory course introduces students to concepts and skills in construction technology, which encompasses plumbing, electrical and network wiring, masonry, heating/cooling, carpentry, and woodworking. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Green Industries (THJ1O)

This exploratory course introduces students to concepts and skills related to the green industries – agriculture, forestry, horticulture, floristry, and landscaping. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Hairstyling and Aesthetics (TXJ1O)

This exploratory course introduces students to concepts and skills related to hairstyling and aesthetics, including hair, nail, and skin care applications. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Health Care (TPJ1O)

This exploratory course introduces students to concepts and skills related to health care, which encompasses personal health promotion, child and adolescent health concerns, and various medical services, treatments, instruments, and technologies. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Hospitality and Tourism (TFJ1O)

This exploratory course introduces students to concepts and skills related to hospitality and tourism, focusing on the areas of food handling, food preparation, the origins of foods, event planning, and local tourism. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Manufacturing Technology (TMJ1O)

This exploratory course introduces students to concepts and skills related to manufacturing technology, which encompasses technical drawing, properties and preparation of materials, manufacturing techniques, and control systems. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Technological Design (TDJ1O)

This exploratory course introduces students to concepts and skills related to technological design, which involves the development of solutions to various design challenges and the fabrication of models or prototypes of those solutions. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

Exploring Transportation Technology (TTJ1O)

This exploratory course introduces students to concepts and skills related to transportation technology, which encompasses the maintenance, servicing, and repair of various types of vehicles, aircraft, and/or watercraft. Students will develop an awareness of related environmental and societal issues, and will begin to explore secondary and postsecondary pathways leading to careers in the field.

A. TECHNOLOGY FUNDAMENTALS

OVERALL EXPECTATIONS

By the end of this course, students will:

A1. demonstrate an understanding of the fundamental concepts and skills required in the planning and development of a product or service, including the use of a design process and/or other problem-solving processes and techniques;

A2. demonstrate the ability to use a variety of appropriate methods to communicate ideas and solutions;

A3. evaluate products or services in relation to specifications, user requirements, and operating conditions.

SPECIFIC EXPECTATIONS

A1. Planning and Development

By the end of this course, students will:

A1.1 describe a design process or other problem-solving process for planning and developing products and/or services (see pp. 16–19);[1]

A1.2 describe problem-solving processes and techniques for solving various kinds of problems in different technological areas;

A1.3 apply correctly the mathematical and scientific concepts and skills required in the planning and development of a product and/or service;

A1.4 incorporate appropriate technological concepts *(e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication/building/creation, function, innovation, material, mechanism, power and energy, safety, structure, systems)* in the design, fabrication or delivery, and evaluation of a product or service (see pp. 5–6);

A1.5 describe the characteristics of a variety of materials used in the fabrication of a product or the delivery of a service *(e.g., strength, durability, possible toxicity, lifespan, density, nutritional value, flavour, asepsis)* and identify other relevant considerations to be made in relation to those materials *(e.g., cost, availability)*;

A1.6 demonstrate an understanding of the roles of various team members in a group project *(e.g., leader, recorder, timekeeper)*;

A1.7 research and describe the development of a Canadian technological innovation or invention *(e.g., snowmobile, personal communication device, potato digger, odometer, anti-gravity suit, CPR mannequin, zipper)*.

A2. Communication

By the end of this course, students will:

A2.1 use a variety of appropriate methods to communicate information or ideas and concepts during the planning and production stages of a project *(e.g., production plans, scripts, flow charts, storyboards, sketches, technical drawings, recipes, client consultation reports, design briefs)*;

A2.2 use correct terminology to identify and describe various processes, tools, and equipment used in creating products or delivering services *(e.g., **processes:** levelling, squaring, formulating, baking, sterilizing, colouring; **tools:** pruning saw, wire cutter, curling iron; **equipment:** USB flash drive, tire balancer, camcorder, flat iron, deep fryer, magnifying lamp, ultraviolet sanitizer, solderless breadboard, measuring cup, thermometer)*;

1. The products and services referred to throughout this course should be drawn from various areas of technological education, which include communications technology, computer technology, construction technology, green industries, hairstyling and aesthetics, health care, hospitality and tourism, manufacturing technology, technological design, and transportation technology. Examples of products might include an electronic communication device, a jewellery box, an individual meal plan or a restaurant menu, a traffic light model and simulator, a Rube Goldberg machine, a piece of animation, a website, a photography exhibit, a wheelchair ramp, a locker organizer, theatre props, a garden, a floral arrangement, and a plant stand. Examples of services might include staging a fashion show, providing health care services, operating a food bank, and planning and producing holiday events or a school production.

A2.3 use metric and imperial units of measurement *(e.g., **metric:** degrees Celsius, joules, micrometres [microns], millimetres, kilohms, L/100 km, tonnes; **imperial:** degrees Fahrenheit, BTUs, knots, mils, inches, feet, miles per gallon, pounds per square inch, tons)* and the abbreviations or symbols associated with them correctly and as appropriate to the task;

A2.4 describe and use various forms of communication to document the progress and results of the development of a product or service *(e.g., tracking sheets, production status reports, a multimedia presentation, a graphic or animated presentation, technical drawings, updates on a website, a blog, technical reports)*;

A2.5 describe some common applications of information and communications technology in various technological areas *(e.g., automotive on-board diagnostics, computers, non-linear video editing, broadband networks, weather reports, online reservation systems, electronic medical alert systems)*.

A3. Product or Service Evaluation

By the end of this course, students will:

A3.1 evaluate a product or service, and processes associated with its development, on the basis of a set of criteria relevant to that product or service *(e.g., adherence to specifications, ease of use, attractive appearance, ruggedness, clean joints, acceptable weld bead, uniform colour, adherence to forest management plan, nutritional value)*;

A3.2 suggest improvements to a product or service on the basis of a set of criteria relevant to that product or service *(e.g., durability, reliability, ease of use, eco-friendliness, appearance, safety, customer satisfaction)*.

B. TECHNOLOGICAL SKILLS

OVERALL EXPECTATIONS

By the end of this course, students will:

B1. use problem-solving processes and project-management strategies in the planning and fabrication of a product or delivery of a service;

B2. fabricate products or deliver services, using a variety of resources.

SPECIFIC EXPECTATIONS

B1. Problem Solving and Project Management

By the end of this course, students will:

B1.1 apply the steps of a design process or other problem-solving process to plan and develop products and services *(e.g., define the problem or challenge, taking into account relevant contextual or background information; gather information [about criteria, materials, constraints]; generate possible solutions, using techniques such as brainstorming; choose the best solution; develop and produce a model or prototype; test the model or prototype; incorporate improvements or redesign and retest; report on results)* (see pp. 16–19);

B1.2 apply the steps and/or techniques of appropriate problem-solving processes and methods *(e.g., diagnostics, reverse engineering, trial and error, divide and conquer, parts substitution, extreme cases)* to solve a variety of problems in different technological areas (see pp. 16–19);

B1.3 identify and discuss solutions that have been developed to address key technological problems or meet human needs in various areas of technology *(e.g., catalytic converters, CPU heat sinks, solar cells, regenerative brake energy systems, wind turbines, convection ovens, internal defibrillators, scent-free and hypoallergenic products)*;

B1.4 use a variety of sources to research technological solutions to specific problems or challenges *(e.g., the Internet, reference books, journals or magazines, experts)*;

B1.5 demonstrate the ability to work cooperatively in a group environment to solve problems *(e.g., share tools, tasks, materials, and resources)*;

B1.6 use appropriate communication, time-management, and organizational strategies *(e.g., active listening, scheduling, flow charts, meal plans)* to facilitate the process of developing a product or service.

B2. Creating Products or Delivering Services

By the end of this course, students will:

B2.1 use appropriate tools, materials, and equipment *(e.g., **tools:** hammer, chisel, screwdrivers, soldering iron, cheese grater, sieve, seam ripper; pruning shears, hair clipper; **materials:** wood, aluminum, polystyrene, paper, wax, clay, textiles, electronic components, mulch, hair colour; **equipment:** drill press, test meter, computer, software, printer, video camera, thermometer, grill, sewing machine, autoclave, curling iron)* to create products or deliver services;

B2.2 make accurate measurements using a variety of tools *(e.g., ruler, scale, tape measure, caliper, micrometer, thermometer, measuring cup)*, in metric or imperial units, as appropriate;

B2.3 meet all design criteria *(e.g., technical requirements, type and quality of materials, appearance, ease of use, safety, timeline, client's expectations)* in creating a product or delivering a service;

B2.4 demonstrate the ability to use, maintain, and store tools and equipment properly and with care.

C. TECHNOLOGY, THE ENVIRONMENT, AND SOCIETY

OVERALL EXPECTATIONS

By the end of this course, students will:

C1. demonstrate an awareness of the effects of various technologies on the environment;

C2. demonstrate an awareness of how various technologies affect society, as well as how society influences technological developments.

SPECIFIC EXPECTATIONS

C1. Technology and the Environment

By the end of this course, students will:

C1.1 describe how various technologies *(e.g., integrated pest management, water purification, mass transit, agricultural technologies, resource extraction)* affect the environment, and identify important environmental considerations associated with different areas of technology *(e.g., how to deal with ozone-depleting chemicals or hazardous wastes; how to increase opportunities for recycling, conservation, use of sustainable methods or materials)*;

C1.2 identify technological solutions that have been designed in response to environmental concerns *(e.g., catalytic converter, wind turbines, solar-powered signs, biofuels, non-toxic and hypoallergenic products, recyclable and reusable packaging)*;

C1.3 follow proper procedures for the safe storage and disposal of materials and waste products *(e.g., keep flammable solvents, paints, and varnishes in non-combustible cabinets; recycle used motor oil)*.

C2. Technology and Society

By the end of this course, students will:

C2.1 describe some of the effects that technological innovations of the past have had on society *(e.g., effects on health, on people's ability to travel and communicate, on living standards, on education)* and the economy *(e.g., creation of new types of jobs, automation of factories)*;

C2.2 describe how society is being affected today by various new and emerging technologies *(e.g., electronic messaging, Global Positioning System [GPS], wireless access, hybrid vehicles, nanotechnology, biotechnology)*;

C2.3 describe economic, ecological, social, and safety considerations facing consumers when they make choices between particular products or services *(e.g., natural versus synthetic materials, renewable versus non-renewable resources; inexpensive products created in developing countries versus more costly products created domestically; higher-priced products with additional safety features versus less costly products without them)*;

C2.4 demonstrate an understanding of, and respect for, cultural and social diversity as they develop and create various products or services *(e.g., prepare foods from various countries around the world, use video or graphic images that are representative of the school population, demonstrate hairstyles from various cultures, compare traditional landscaping styles of different cultures)*;

C2.5 describe how social and economic factors influence the development and use of technology *(e.g., high fuel prices and safety concerns influence automotive design, rotating blackouts speed the development of energy alternatives, people's desire to be connected with family and friends drives telephone and wireless device design)*.

D. PROFESSIONAL PRACTICE AND CAREER OPPORTUNITIES

OVERALL EXPECTATIONS

By the end of this course, students will:

D1. follow safe practices and procedures when using materials, tools, and equipment;

D2. identify careers in various technological fields, and describe the educational requirements for them.

SPECIFIC EXPECTATIONS

D1. Health and Safety

By the end of this course, students will:

D1.1 use appropriate personal protective equipment *(e.g., gloves, safety glasses or goggles, hard-hat, hearing protection, respirator mask)*;

D1.2 use the safety features of tools and equipment *(e.g., bandsaw guard, stock guides, tire balancer cover)* appropriately;

D1.3 follow proper shop practices, which help protect the safety of workers *(e.g., keep work area clean and organized, avoid horseplay)*;

D1.4 use appropriate aids *(e.g., push stick, feather-board, soldering iron holder)* to minimize the risk of injury;

D1.5 use appropriate strategies to prevent health problems (*e.g., follow proper sanitation and sterilization practices; ensure proper ventilation; use proper lifting techniques; follow Workplace Hazardous Materials Information System [WHMIS] and Material Safety Data Sheet [MSDS] guidelines)*.

D2. Career Opportunities

By the end of this course, students will:

D2.1 describe secondary and postsecondary education pathways (i.e., selection of courses, programs, experiential learning opportunities, and other learning opportunities at the secondary and postsecondary levels, including apprenticeship training, certificate programs, college programs, and/or university programs) leading to a variety of careers in technological fields;

D2.2 use various criteria to assess selected careers in technological fields *(e.g., salary, job demand, working conditions, social trends)*;

D2.3 identify groups and programs that are available to support students who are interested in pursuing non-traditional career choices in a technology industry *(e.g., mentoring programs, virtual networking/support groups, specialized postsecondary programs, relevant trade/industry associations)*;

D2.4 demonstrate an understanding of the Essential Skills that are important for success in the technology industries, as identified in the Ontario Skills Passport *(e.g., reading text, writing, document use, computer use, oral communication, numeracy, thinking skills)*;

D2.5 demonstrate an understanding of the work habits that are important for success in the technology industries, as identified in the Ontario Skills Passport *(e.g., working safely, teamwork, reliability, organization, working independently, initiative, self-advocacy, customer service)*;

D2.6 develop and/or select pieces of work and other materials that provide evidence of their skills and achievements in technology, for inclusion in a portfolio *(e.g., Passport to Safety certificate, project photographs, sketches, drawings, skills checklist, work logs)*.

Communications Technology, Grade 10

Open **TGJ2O**

This course introduces students to communications technology from a media perspective. Students will work in the areas of TV/video and movie production, radio and audio production, print and graphic communications, photography, and interactive new media and animation. Student projects may include computer-based activities such as creating videos, editing photos, working with audio, cartooning, developing animations, and designing web pages. Students will also develop an awareness of environmental and societal issues related to communications technology, and will explore secondary and post-secondary education and training pathways and career opportunities in the various communications technology fields.

Prerequisite: None

A. COMMUNICATIONS TECHNOLOGY FUNDAMENTALS

OVERALL EXPECTATIONS

By the end of this course, students will:

A1. demonstrate an understanding of the core concepts, techniques, and skills required to produce a range of communications media products or services;

A2. demonstrate an understanding of technical terminology, basic scientific concepts, and mathematical concepts used in communications technology and apply them to the creation of media products;

A3. demonstrate an understanding of and apply the interpersonal and communication skills necessary to work effectively in a team setting.

SPECIFIC EXPECTATIONS

A1. Core Concepts, Techniques, and Skills

By the end of this course, students will:

A1.1 describe the elements of the universal communications model *(e.g., message, sender, mode of transmission, receiver)*;

A1.2 demonstrate an understanding of design elements *(e.g., line, form, colour, texture, space)* and principles *(e.g., balance, rhythm, proportion, contrast, flow)*;

A1.3 demonstrate an understanding of production processes and workflows *(e.g., subject/location selection, lighting set-up, shooting, digital imaging, and digital editing in audio/video and photography; layout, pre-press, presswork, and binding in publishing; site design, page layout, content development, and testing in web design)*;

A1.4 identify different types of communications technology devices and their components *(e.g., cameras and accessories, lighting equipment, audio and video recorders, audio mixers, scanners, printing equipment)*, and explain how they are used to produce communications products and services;

A1.5 identify different types of communications software used to create communications technology products and services *(e.g., software for photo, audio, and video editing, animation, page layout, web page creation, and computer graphics)* and describe how they are used.

A2. Technical Terminology and Scientific and Mathematical Concepts

By the end of this course, students will:

A2.1 demonstrate an understanding of communications technology terms, and use them correctly in oral and written communication *(e.g., composition, contrast, scene, typography, layout, storyboard, clip, fade, dissolve, levels, layers, SFX, filters, timeline, site map, navigation)*;

A2.2 demonstrate an understanding of basic scientific concepts that relate to processes and technologies used in communications technology *(e.g., optical principles related to use of cameras and lighting, electronic concepts related to sound recording, principles of digitization and their application to digital imaging and recording)*;

A2.3 apply mathematical concepts and formulas as required to complete communications technology tasks *(e.g., calculation of lighting ratios and exposures in photography and videography, timing of sequences in audio and video editing, calculation of paper and ink requirements in printing, determination of image resolution requirements for printing versus Internet use, calculation of file size)*.

A3. Teamwork

By the end of this course, students will:

A3.1 explain the value of sharing ideas, information, resources, and expertise when working in a team setting;

A3.2 describe and use techniques that encourage participation by all members of a team *(e.g., brainstorming, group discussion, celebration of others' thoughts or contributions, acceptance of cultural differences)*;

A3.3 describe and use concepts and techniques that facilitate effective collaboration in a team environment *(e.g., cooperative discussion, conflict resolution techniques, motivation techniques, respect for the ideas of others)*.

B. COMMUNICATIONS TECHNOLOGY SKILLS

OVERALL EXPECTATIONS

By the end of this course, students will:

B1. apply project management techniques to the planning and development of communications media products;

B2. apply a design process or other problem-solving processes to meet a range of challenges in communications technology;

B3. create products or productions that demonstrate competence in the application of creative and technical skills.

SPECIFIC EXPECTATIONS

B1. Project Management

By the end of this course, students will:

B1.1 use a variety of planning techniques and tools *(e.g., research, project proposals, production schedules, scripts, blocking, storyboards, site maps, design briefs)* when creating plans for communications technology projects;

B1.2 use appropriate organizational and time-management tools and software applications *(e.g., student planners, journals, electronic organizers, organizing software)* to ensure that project deadlines are met.

B2. Problem Solving

By the end of this course, students will:

B2.1 define a problem or challenge precisely and in adequate detail, taking into account relevant contextual or background information;

B2.2 define project objectives and performance criteria precisely and in adequate detail, and identify constraints such as cost, time, or technology restrictions that will limit design or problem-solving options;

B2.3 use a variety of information sources and research techniques *(e.g., Internet and library searches, checking manuals and other printed materials, consulting experts)* to help identify possible solutions;

B2.4 use idea-generating techniques such as brainstorming or clarification techniques such as situation analyses to help identify possible solutions;

B2.5 use charts or hand-drawn sketches to organize sequences, clarify relationships, or compare alternatives;

B2.6 evaluate possible solutions to identify those that most effectively meet the objectives and criteria within the existing constraints.

B3. Process and Production Skills

By the end of this course, students will:

B3.1 apply creative skills, equipment operating skills, and software skills to create components for a media production *(e.g., text, video footage, voice-overs, graphics, animations for a video promoting a school event)*;

B3.2 apply editing skills to integrate the components into a unified and effective production.

C. TECHNOLOGY, THE ENVIRONMENT, AND SOCIETY

OVERALL EXPECTATIONS

By the end of this course, students will:

C1. describe the impact of communications media technologies and activities on the environment and identify ways of reducing their harmful effects;

C2. demonstrate an understanding of social effects and issues arising from the use of communications media technologies and the importance of representing cultural and social diversity in media productions.

SPECIFIC EXPECTATIONS

C1. Technology and the Environment

By the end of this course, students will:

C1.1 describe the effects of current communications technologies on the environment *(e.g., effects related to paper consumption, energy use, light and sound pollution, disposal of obsolete equipment)*;

C1.2 identify sustainable practices that are currently used or can be used to minimize the impact of communications technologies on the environment *(e.g., recycling of paper, recycling or reuse of electronic components, use of energy-efficient equipment, use of sleep mode when computers are temporarily unused)*.

C2. Technology and Society

By the end of this course, students will:

C2.1 demonstrate an understanding of social standards and cultural sensitivity and use appropriate and inclusive content, images, and language in communications media productions *(e.g., including people from different races, cultures, and backgrounds in media productions; portraying minority groups with respect and sensitivity; avoiding sexism, homophobia, and cultural or racial bias)*;

C2.2 describe the effects of recent changes in communications technology and applications on society and the economy *(e.g., effects arising from the use of devices such as cellular phones, personal digital assistants [PDAs], and portable media players and from the emergence of computer-based social networks, user-generated web content such as wikis and blogs, and easy-to-download music file formats)*;

C2.3 identify emerging communications technologies and describe their potential impact on society and the economy;

C2.4 describe legal concepts and issues relating to communications technology and media production *(e.g., copyright, privacy rights, consent)*;

C2.5 describe social and ethical issues relating to the use of communications technology *(e.g., promotion of hatred, irresponsible use of the Internet, cyberbullying, cultural appropriation)*.

D. PROFESSIONAL PRACTICE AND CAREER OPPORTUNITIES

OVERALL EXPECTATIONS

By the end of this course, students will:

D1. demonstrate an understanding of and apply safe work practices in communications technology activities;

D2. identify career opportunities in communications technology and demonstrate an understanding of the skills, work habits, education, and training required for entry into postsecondary programs or employment in these fields.

SPECIFIC EXPECTATIONS

D1. Health and Safety

By the end of this course, students will:

D1.1 describe industry hazards *(e.g., ergonomic hazards, mechanical hazards, temperature hazards, electrical hazards)* and accident prevention methods *(e.g., health and safety audits)*, and identify sources of accident prevention information *(e.g., the Workplace Hazardous Materials Information System [WHMIS], Passport to Safety)*;

D1.2 apply safe work practices when performing communications technology tasks *(e.g., use ergonomically designed equipment, keep work area tidy, avoid eye strain, use moderate volume levels)*.

D2. Career Opportunities

By the end of this course, students will:

D2.1 identify career opportunities in communications technology and describe the qualifications needed for entry into these positions *(e.g., apprenticeship training, college diploma, university degree, workplace experience)*;

D2.2 identify groups and programs that are available to support students who are interested in pursuing non-traditional career choices in the communications technology industry *(e.g., mentoring programs, virtual networking/support groups, specialized postsecondary programs, relevant trade/industry associations)*;

D2.3 demonstrate an understanding of the Essential Skills that are important for success in the communications technology industry, as identified in the Ontario Skills Passport *(e.g., reading text, writing, document use, computer use, oral communication, numeracy, thinking skills)*;

D2.4 demonstrate an understanding of the work habits that are important for success in the communications technology industry, as identified in the Ontario Skills Passport *(e.g., working safely, teamwork, reliability, initiative, customer service, entrepreneurship)*;

D2.5 develop and/or select pieces of work and other materials that provide evidence of their skills and achievements in communications technology, for inclusion in a portfolio *(e.g., Passport to Safety certificate, skills checklist, photographs, digital media projects)*.

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