



21ST ONTARIO TECHNOLOGICAL SKILLS COMPETITION

Technology Challenge -Team of 4

Grades 7&8



Contest Date: Monday, May 17, 2010

**Location: RIM Park and Manulife Financial Sportsplex
2001 University Avenue East, Waterloo, Ontario**

TECHNICAL CHAIR :

Derek Webster – UGDSB: derek.webster@ugdsb.on.ca

For more information, contact the technical chairs at the email above or the Skills Canada – Ontario Competition Department at otsc@skillscanada.com.

- This contest is offered as an official challenge

PURPOSE OF THE CONTEST:

Greetings Future Designers and Engineers!

WELCOME to the 21st annual Skills Canada - Ontario grade 7&8 Technology Challenge!

As a part of the Ontario Technical Skills Competition - Elementary Technology Activity Day, school boards and individual schools are invited to showcase the talents of Grades 7-8 students within the Grade 7-8 Technology Challenge on May 17, 2010 at RIM Park and Manulife Financial Sportsplex, Waterloo.

The format for this year's competition will be a team-based technology challenge using typical science & technology construction materials, hand tools, accessories and cordless drills.

Teams of four (4) students from schools across Ontario will have an opportunity to compete with one another in a friendly environment, demonstrating their creativity, collaboration, and problem solving in an open-ended challenge. It will consist of (1) designing, (2) documenting, (3) constructing, and (4) demonstrating a solution to a very specific technological design challenge related to this year's theme – the 2010 Olympic Games!

Generally, teams will be assessed on the following:

- use design process and construction techniques to neatly assemble a solution to the challenge within time constraints
- demonstrate mathematical, scientific and technological knowledge
- exhibit sound design principles and construction techniques
- demonstrate leadership and teamwork skills
- demonstrate efficient use of materials
- demonstrate best practices in using tools and materials
- use tools and equipment properly and safely
- write design brief to document design process and construction experience
- organize and present an informative solution to the challenge

SKILLS AND KNOWLEDGE TO BE TESTED:

Prior Knowledge:

The Grade 7 & 8 Technology Challenge has at its core the following prior knowledge and skills:

- Pulleys and Gears (and cams) – Grade 4
 - demonstrate an understanding of the characteristics of pulleys and gears
 - design and make pulley systems and gear systems, and investigate how motion is transferred from one system to another
- Forces Acting on Structures – Grade 5
 - design and make load-bearing structures and different mechanisms, and investigate the forces acting on them
 - evaluate the design of systems that include structures and mechanisms, and identify modifications to improve their effectiveness
- Motion – Grade 6
 - demonstrate an understanding of different kinds of motion (linear, rotational, reciprocating, oscillating)
 - design and make mechanical devices, and investigate how mechanisms change one type of motion into another and transfer energy from one form to another
 - identify modifications to improve the design and method of production of systems that have mechanisms that move in different ways
- Energy and Control: Electricity – Grade 6
 - design and construct a variety of electrical circuits and investigate ways in which electrical energy is transformed into other forms of energy.

The Grade 7 & 8 Technology Challenge will reflect an activity consistent with the following strands from the Ontario Curriculum, Grades 1 – 8: Science and Technology:

- Structures and Mechanisms: Grade 7 and 8
- Matter and Materials: Grade 7 and 8

Within each of the above strands, the technology challenge will allow students to demonstrate the following expectations:

GRADE 7

STRUCTURES AND MECHANISMS / MATTER AND MATERIALS

- demonstrate an understanding of the relationship between the effectiveness of structural forms and the forces that act on and within them;
- design and make a variety of structures, and investigate the relationship between the design and function of these structures and the forces that act on them;
- demonstrate an understanding of the factors (e.g., availability of resources) that must be considered in the designing and making of products that meet a specific need;
- formulate questions about and identify needs and problems related to the strength of structures, and explore possible answers and solutions.

GRADE 8

STRUCTURES AND MECHANISMS / MATTER AND MATERIALS

- design and build devices that use pneumatic or hydraulic systems;
- design and construct a model of a common device that uses pneumatic or hydraulic systems;
- use the most appropriate items from a selection of tools, equipment, and materials to perform a specific task;
- follow safe work procedures;
- demonstrate an understanding of the factors that contribute to the efficient operation of mechanisms and systems;
- design and make systems of structures and mechanisms, and investigate the efficiency of the mechanical devices within them;
- demonstrate understanding of the factors that can affect the manufacturing of a product, including the needs of the consumer;
- formulate questions about and identify needs and problems related to the efficient operation of mechanical systems;
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, written notes and descriptions, charts, graphs, drawings, and oral presentations.

Grade 7 and 8

Language: Oral and Visual Communication

- express and respond to a range of ideas and opinions concisely, clearly, and appropriately;
- contribute and work constructively in groups.

EQUIPMENT AND MATERIALS:

TECHNOLOGICAL SYSTEMS:

Students should be somewhat familiar with as many of the following as possible:

- designing and making frameworks from 3/8" square basswood (or other wood)
- designing and making basic hinge mechanisms – frames, doweling for pins, attaching pins, choosing drills sizes to match doweling, using drill and vice
- designing and making robotics and mechanical mechanisms (horizontal and vertical movement systems)
- designing and making pneumatic/hydraulic systems – connecting syringes using mounts, hinges, pins, brackets and frames, moving linearly and rotationally

- use of gusset plates (stiff cardboard or Bristol board) and braces (ties and struts) to strengthen frames – triangulation
- techniques for attaching axles to frameworks, wheels, pulleys, cams, gears, spools
- techniques for transmitting and changing motion using pneumatic/hydraulic systems. wheels, pulleys, cams, gears
- techniques for building ratchet systems, hand cranks, 3 classes of lever systems, simple machines
- techniques for building simple series and parallel circuits

HAND TOOLS:

Students should be familiar with proper and safe use of the following tools and equipment:

- mini saws
- mitre-board/bench hook
- easy cutters (wood shears)
- hand-drills and vices
- carpenter's glue, finishing nails, hammers
- hot glue guns
- scissors, rulers, pencils
- cordless drills

MATERIALS:

This materials list is representative. Other found materials may be available for use at the Ontario Grade 7 & 8 Technology Challenge:

- card-stock
- masking and duct tape
- twine and string
- elastic bands
- fasteners (paper-clips, tacks, etc...)
- 10mm (3/8") square basswood
- 3/16" (0.47cm) dowelling
- carpenter's glue
- wheels and axles, gears, pulleys, Popsicle sticks, sandpaper, and a selection of found materials

POWER SOURCES:

- electrical ("C" batteries, 1.5v motors, wire, switches, resistors)
- mechanical (winches, pulleys, gears, levers, cams)
- pneumatics/hydraulics (syringes, tubing, connectors, valves)

All tools and materials will be provided. No other equipment will be allowed in the competition area.

SAFETY:

Safety is a priority at the Ontario Technological Skills Competition. At the discretion of the judges and technical chairs any competitor can be removed from the competition site for not having the proper safety equipment and/or not acting in a safe manner.

1. It is mandatory for all competitors to wear CSA approved eyewear (including side shields for prescription eyewear).*
2. It is mandatory for all competitors to wear closed toe footwear.* NO SANDALS
3. Jewellery such as rings, bracelets and necklaces or any items deemed unsafe by competition judges shall be removed.*
4. Any attire that is deemed unsafe by competition judges will not be permitted.*

*Competition judges will have final authority on matters of safety.

JUDGING CRITERIA:

For the Grade 7 & 8 Technology Challenge, students should be made aware that they would be assessed on their ability to demonstrate design principles. This suggests the use of one of several available problem-solving models. To outline the process of developing solutions to the challenge and to meet the curriculum expectations within each challenge, the following components of a problem-solving model might be considered:

DESIGNING (Design Brief):

Situation:

A design challenge will be introduced with a short paragraph that sets the stage for the Design Challenge. A “situation” gives students some the background details – i.e. in which the problem will need to be solved.

Problem Statement:

From the Situation, clearly write the “problem” that you will be solving.

i.e.: “I will be designing and making a _____ to _____...”

Investigating:

This is the beginning point for investigations. Factors to consider include:

- Document all significant points for use in Design Brief.
- Read carefully the directions stated by the challenge in the context of the “situation“ or “need”.
- Research - what resources are available for you to use as Reference Materials?

- Brainstorm - how have other engineers and designers solved similar problems?
- Review materials that are available within the challenge – which ones might assist with your solution?
- Are there advantages that a selection of one material would have over another? Are there limitations to material choices?
- What structures and mechanisms will assist with a possible solution? Are there advantages or limitations with the available options?
- Sketch 2 or 3 alternative solutions in which you would solve the problem.
- Efficient use of materials – has the choice of structures and mechanisms allowed for an efficient solution with a minimum of waste?
- What considerations of safety, function, appropriateness of size, end use, durability, quality and appearance would apply?
- As a team, choose the best possible solution.

CONSTRUCTING:

Once students have selected the best solution, they next need to plan for its construction. Factors to consider at this stage include:

- Document all significant points for use in Design Brief
- Identify the logical steps required to make your solution
- Identify all consumable materials, tools and equipment that will be needed
- Divide the logical steps of the chosen solution into specific tasks
- Team leader must allocate tasks to team members
- Select the tools and devices and calculate the amount of materials required
- Identify all safety concerns for these steps
- Look for simplification of assembly procedures
- Consider modifications and alter sketches as required
- Consideration of time and its allocation to the completion of component parts
- Following safe procedures with all materials, tools and equipment
- Maintain a neat and safe workstation
- Make all parts then assemble your best solution

ASSESSING:

Students will assess the success of their chosen solution at each stage. Questions they should ask themselves include:

- Document all significant points for use in Design Brief.
- Does the final solution solve your Problem Statement?
- Is the final solution complete, or is it a work in progress?
- Is each component part assembling the way it was intended? Can it be modified in any way to work better?

- Is each component part going to fit properly with the other parts?
- Can any component or assembly method be modified within the time constraints to work better? If this challenge was done again, could it be improved?
- Write and finalize the Design Brief.
- Organize the team's Presentation.
- Have the presentation materials been completed and are members ready to present their component of the Design Brief?

DEMONSTRATING:

Students will present their solutions to the judges. They should practice typical public speaking & presentation writing skill sets.

As the rules state, there are no ties. If the score is even after the contest the Demonstrating component will be used as the tie breaker.

RULES AND REGULATIONS:

Please be sure to review all rules and regulations in the Elementary Competition Information Package, available online at www.skillsontario.com.

If there is any discrepancy between the English and French information in the scope, the English portion will be taken as the correct information.

Immediate disqualification may occur at the discretion of the technical chair if a competitor displays any one of the following:

- Acts inappropriately
- Shows disregard for the safety of themselves or those around them
- Breaks the established rules and regulations including:
 - Uses equipment or material that is not permitted
 - Dishonest conduct (cheating)
 - Speaks with those outside the contest area
 - Arrives to the contest site late

Registration for all contests will happen on the contest site the morning of the competition.

CLOTHING REQUIREMENTS:

Competitors are to be dressed in a clean and appropriate manner. Competitors are not permitted to wear clothing with logos or printing. The exception to this rule is the logo of the school, school board, college or MTCU District that the competitor is representing. ONLY the logo of the institution under which the space is registered can be visible. Corporate logos or names are not permitted on a competitor's clothing.

MEALS:

Skills Canada – Ontario will provide a lunch and drink for competitors. Lunch will be confirmed closer to the competition; however it is likely to be two slices of pizza and one pop. If participants feel they require additional sustenance, it is highly recommended they bring snacks with them. Any food brought to the venue must be nut free. Any nut products found on site will be removed.

OTSC AGENDA:**May 17, 2010****Ontario Technological Skills Competition**

8 :30am – 9 :00am	Registration at each contest site
9 :00am – 9 :30am	Orientation
9 :30am – 11:30am	Competition
11 :30am – 12:30pm	Lunch
12:30pm – 3 :30pm	Competition
5 :00pm	Awards Ceremony

Contest Location: RIM Park and Manulife Financial Sportsplex, 2001 University Avenue East Waterloo – a map is available online at www.skillsontario.com/maps/maps.html

○ **Closing Ceremony Location:** RIM Park and Manulife Financial Sportsplex, Banquet Hall.

ADDITIONAL INFORMATION:

- Results for the OTSC will be posted online starting May 20, 2010 at www.skillsontario.com
- Information on the Conflict Resolution Procedure can be found on our website in the Competition Information Package.
- If you have any questions regarding the OTSC or contest, please contact Skills Canada – Ontario or the technical chair prior to May 7, 2010 as all staff will be onsite setting up the following week.