OCTE 2012 – Elementary Conference Workshops

GRADE 6 | UNDERSTANDING MATTER AND ENERGY
ELECTRICITY AND ELECTRICAL DEVICES

PRECISION MOVEMENT GAME DESIGN CHALLENGE

OVERALL EXPECTATIONS

By the end of Grade 6, students will:
2. investigate the characteristics of static and current electricity, and construct simple circuits.

SPECIFIC EXPECTATIONS

2. Developing Investigation and Communication Skills

By the end of Grade 6, students will:

2.1 follow established safety procedures for working with electricity (e.g., ensure hands are completely dry when working with electricity; be aware of electrical hazards at home, at school, and in the community)

2.5 use technological problem-solving skills (see page 16) to design, build, and test a device that transforms electrical energy into another form of energy in order to perform a function (e.g., a device that makes a sound, that moves, that lights up) Sample guiding questions: What function will your device perform? What does your device transform the electrical energy into? How does your device work?

2.6 use appropriate science and technology vocabulary, including **current, battery, circuit, transform**, static, electrostatic, **and energy**, in oral and written communication

2.7 use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes (e.g., using scientific and technological conventions, create a labeled diagram showing the component parts of the device they created to transform electrical energy into another form of energy and perform a function)

Learning Goals

1. Students will use all tools and apparatuses safely, and appropriately.
2. Students will use technological problem-solving skills to design, construct, and test a precision movement game that transforms electrical energy into sound energy. The design must include the ability to monitor changes in a subject's ability to perform precision movements (for the purpose of comparison).
3. Students will describe how their device functions, what it transforms electrical energy into, and how the device works.
4. Students will use vocabulary such as current, battery, circuit, transform, ..., and energy, in their reports (oral and/or written).
5. Students will use variety of forms to present their solutions to the design challenge, and report their findings to their teacher and classmates. The students' presentations will include labelled diagrams of their game and the test they designed, as well as, charts and graphs to display data recorded during their observations.

Assessment and Evaluation

For Assessment and Evaluation support, please see Appendix G.

- Check items you wish to evaluate during the completion of this unit. Skip items that do not apply to your current program needs.
- You may differentiate your assessment by offering your students a variety of these items as "choices", while making other items mandatory.
- Please see Appendix B for this unit's assessment rubric (assessment **of** learning).
- Please see Appendix C for this unit's Grade Sheet (assessment **of** learning).
- Please see Appendix D for the Continuum for Technological Problem Solving rubric (assessment **for/as** learning).
- Please see Appendix E for the Assessment As Learning, Student Self-Assessment Log" (assessment **as** learning).
- Please see Appendix F for the Teacher's Record, Assessment **For** Learning sheet.

Success Criteria

Knowledge and Understanding (K&U), please see "Appendix B" for corresponding evaluation items:

- ○ the student acquired a knowledge of facts and terminology related to electrical circuits, as well as, used tools and materials safely and appropriately in building and using a precision movement game (K&U, 1);

- ○ the student understands content (e.g., concepts, ideas, and processes) that address her/his electrical circuit (K&U, 2);

Thinking and Investigation (T&I), please see "Appendix B" for corresponding evaluation items:

- ○ the student identified and located relevant resources, developed hypotheses, regarding potential solutions to his/her design challenge, and developed a suitable set of plans - based on the research and hypotheses noted above (T&I, 3);

- ○ the student used processing skills and strategies (e.g., performing and recording, gathering evidence and data, observing, manipulating materials and using equipment safely, ... proving) to design and fabricate a precision movement game that will emit a sound, over a range of difficulties, to determine the abilities of the user (T&I, 4);

- ○ the student used critical/creative thinking processes, skills, and strategies (e.g., analysing, interpreting, problem solving, evaluating, forming and justifying conclusions on the basis of evidence) to complete a fair test, to determine if her/his prototype meets the design requirements for this task (T&I, 5).

Communication (Com.), please see "Appendix B" for corresponding evaluation items:

- ○ the student completed an oral, visual, or written report that was organized in a clear, logical manner, and included diagrams and models where appropriate (Com., 6);

- ○ the student's report accurately described the steps taken to solve the design challenge, as well as, the learning that he/she acquired from the unit; the student used an appropriate

oral, visual (media), and/or written form for the selected audience e.g., teacher, or teacher and classmates (Com., 7);

- ○ the student included the correct use of scientific vocabulary and terminology (e.g., current, battery, circuit, transform, ..., and energy) in his/her report (Com., 8);

Application (App.), please "Appendix B" for corresponding evaluation items:

- ○ the student followed established safety practices for using apparatuses, tools, and materials (App., 9);
- ○ the student listed beneficial and non-beneficial aspects of his/her design regarding people, other living things, and the environment, and suggested ways to lessen any of the design's undesirable impacts (App., 10);
- ○ the student proposed courses of practical action that involved the use of her/his game (e.g., to assist society in assessing and working with injured people who have had their ability to make precise movements impaired) (App., 11).

Curriculum Connections and Additional Assessment Opportunities

Language:

- Oral Communication, Overall Expectations 2 and 3 (select from specific expectations 2.2 - 2.7, and 3.1);
- Writing, Overall Expectations 1, 2, 3, and 4 (select from specific expectations 1.3, 1.4, 1.5 1.6, 2.1, 2.4, 2.5, 2.6 - 2.8, 3.1 - 3.8, and 4.1);
- Media Literacy, Overall Expectations 3 and 4 (select from specific expectations 3.2 - 3.4, and 4.1).

The Arts:

- Drama, Overall Expectation B1 and B2 (select from specific expectations B1.1 - B1.3, B2.1, and B2.3).

Materials and Tools List

Tools:

- CSA approved safety glasses/goggles, one pair per person (parent volunteers included);
- an approved eyewash station; this can be two eyewash bottles containing approved eyewash fluid that has not reached its expiry time limit after decanting, or an installed system (an actual eyewash station, or approved faucet attachment);
- a first aid kit (please see your Board's Health and Safety Regulations if one is being purchased for your classroom);
- basic hacksaws (junior saws), or coping saws, minimum one for every 3 projects (local hardware stores, www.kidder.ca or www.busybeetools.com),
- bench hooks, minimum one for every 3 projects (www.kidder.ca),
- 3" C-clamps, minimum one for every 3 projects (local hardware stores, www.kidder.ca or www.busybeetools.com),
- a ruler, one per project;
- scissors, one pair for every project (students may supply their own),
- wire strippers (pliers with a side cutter section will work or even scissors; however, they are

more likely to cut the wire during stripping than actual wire strippers), one for every six projects;
- low heat glue guns (one for every five projects);
    - **please note that white glue can be used instead of glue guns for both wood and cardboard versions of this challenge; masking tape, or packing tape can be substituted for the cardboard versions only;**
- work gloves, 1 pair per low heat glue gun;
- aprons, 1 per low heat glue gun.

Materials:

- 3 basswood strips 24" x 1/2" x 1/2" (12mm x 12mm x 61cm) per project (http://kidder.ca/);
    - if funding is not readily available use one corrugated cardboard box per project; make sure it is long enough to provide at least two continuous 18" (45cm) strips;
- battery holders (holds one AA battery), one per project (http://kidder.ca/);
- batteries, one AA battery per project;
- one buzzer (1.5 volt) per project (see http://kidder.ca/);
- copper foil tape, 40" per project (see http://kidder.ca/);
    - bare wire will work if the student's structure design allows it to be pulled tightly enough to eliminate sags and bends (e.g., uncoated wire used for crafts, or for binding items);
- electric tape (10 cm per project to cover bare wire connections);
- 1 meter each of red and black, thin diameter braided copper wire per project (see http://kidder.ca/);
- sand paper, medium to fine grit, 1 sheet for every 5 projects;
- low heat glue sticks (one for every two projects);
    - if using white glue, have about 300ml on hand for the class;
    - if using tape, have about 2m per project available.

Electronic Resources to Get You Started

Internet Resources - always stay on main page:

- http://www.tryengineering.org/lessons/twobutbuz.pdf
- http://www.worldofteaching.com/powerpoints/physics/electric%20circuits.ppt
- Learn360 is licenced through the Ministry of Education (See OSAPAC). If you do not have a username and login, please contact your Board's information services department and request one. http://www.learn360.com/ShowVideo.aspx?ID=148962

Background Knowledge

Be sure to locate your Board's safety policy and documentation procedures. Train your students in the use of the saws, clamps, and bench hooks, (following your Board's requirements) and document this instruction accordingly.

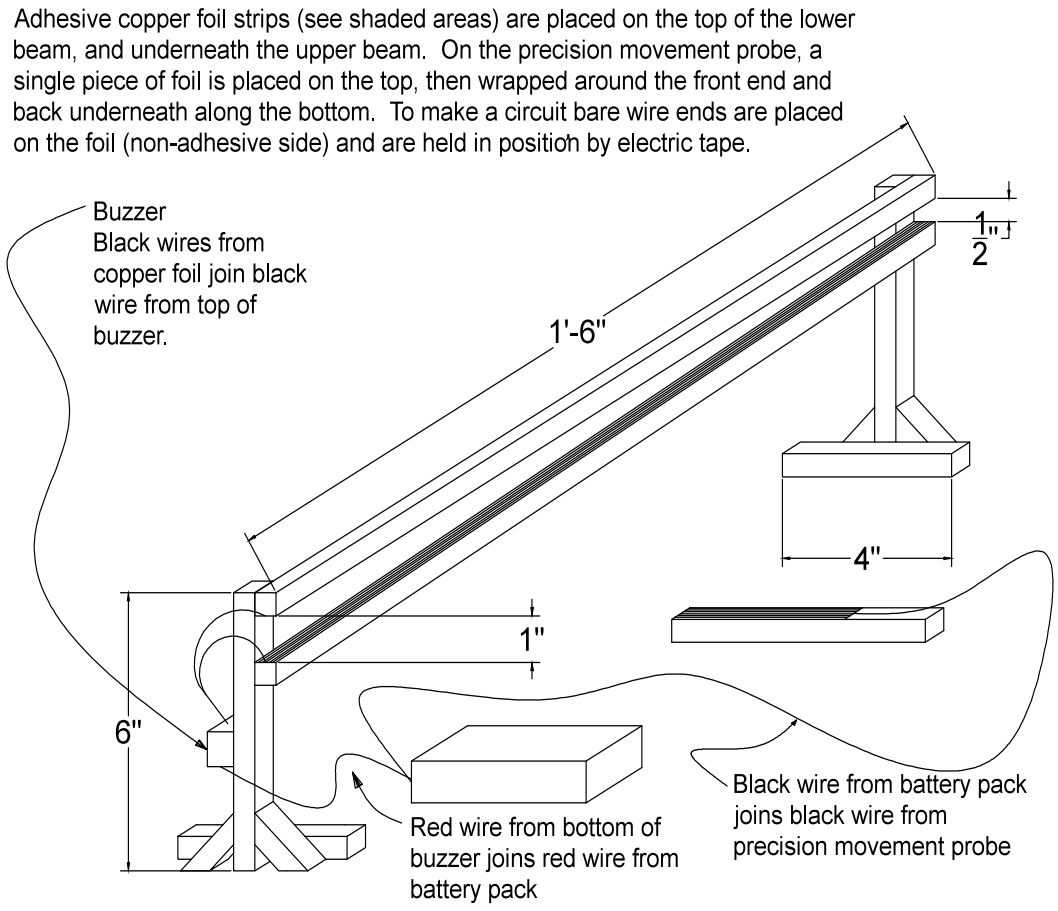
Please see Internet Resources (listed above) for electrical symbols that will be used to create technical drawings of the students' circuits.

This project will require an electrical circuit, completed in series, using a direct current (DC) power source. In this case the DC power source is two AA batteries. Please see Internet Resources (listed above) for examples.

Students will need to join wires to complete the circuit. To do this, place the bare ends of the wires beside each other, facing the same direction. Hold the pair of wires directly below the bare sections; twist the bare ends until they are wound around each other repeatedly. Wrap the bare section of completed joint in electrical tape. Where wires need to be extended, join the extra piece to the main wire in the same manner. Please note that students will have to strip the casing off the ends of these wires to make the joints.

What follows is the most common successful solution to this task. Notice that the space between the two beams narrows as you move from one end to the other. It starts at the student's chosen width and tapers to the thickness of the precision movement probe.

See "Appendix H: Samples" for pictures of student work.



Activity Description

Design Challenge:
Students will research, design, and build (using the materials and tools provided) an electronic precision movement game. The game must challenge the user to maintain precise movement through a test that becomes more challenging as they move from the beginning to the end. The tester must sound a buzzer when the user has reached his/her skill limit. Students must also name their games (e.g., bomb squad trainer, injury recovery tester, etc.).

Students will record their results, make modifications and re-test (if time permits), and complete a report on the steps they took to solve the design challenge.

Minds On/Hands On

1. Small groups, ask students to brainstorm situations or jobs where a person would require a steady hand.
2. Whole class, briefly discuss your students' ideas and record them on your board.
3. Small groups, ask students to brainstorm ideas for devices that test a person's steadiness, as well as, how their device could determine if a person was ready to perform the tasks listed in step 2.
4. Whole class, briefly discuss your students' ideas and record them on your board.

Action

1. Teacher, introduces and distributes the design challenge (Appendix A) to individuals, partners, or small groups, discusses all items with the class, and ensures students understand what must be done.
2. Teacher, distributes the student self-assessment log (Appendix E), and delivers instructions on how it is to be used. As your proceed through the unit, re-address and clarify content items from the logs, prior to having your students address them.
3. Teacher and students, co-construct success criteria based on curriculum expectations and prior learning (for recommended curriculum suggestions see "Success Criteria" above).
4. Teacher, displays tools and materials that are available for the design challenge.
5. Teacher reviews, or provides instruction on, Learning Skills related to this type of task (e.g., safety [teacher follows his/her Board's protocol for instruction regarding the safe use of tools and materials], research, problem solving, collaboration, and responsibility).
6. Teacher follows her/his Board's protocol for documenting student attendance during safety training.
7. Students, research simple DC buzzer circuits, and games that involve steadiness.
8. Students form hypotheses (based on research) regarding potential solutions to their design challenge and investigation.
9. Students list their top ideas for solving the design challenge, sketch out the two that seem the most promising, record reasons for picking them (e.g. aesthetics, function, environmental impact) and submit these items to their teacher for approval.
10. Teacher, reviews sketches for safety and feasibility; students with approved sketches move on to the next step.
11. Students, complete a set of plans for creating a precision movement game, and develop a fair test for their prototype.
12. Teacher, reviews plans and tests for feasibility; students with approved plans and tests move on to the next step.
13. Students create their precision movement game using the materials and tools provided.
14. Students test their precision movement game and determine if the components of the electrical system and game function together to perform the required task. Students record observations, data, and results as they carry out their investigation.

15. If improvements are necessary, and if time permits, students should redesign their prototype and re-test it to determine if the changes were successful.
16. Students, brainstorm, research, and record information and ideas involving precision movement games/testers and their connections to individuals, society, the economy, and the environment.
17. Students, record all final data, observations, research, and insights, then begin working on their reports.

Consolidation

1. In groups, students discuss what went well with their designs and tests, what changes were made, why they were needed, and what they would do differently if given another opportunity. This material should be added to the students' reports.
2. In groups, students discuss/debate the findings and insights they have recorded for item 16; new insights are to be added to the students' reports.
3. In groups, students propose courses of practical action that involve the use of her/his game (e.g., to assist society in assessing and working with injured people who have had their ability to make precise movements impaired).
4. Students, complete and hand in a written report, or present an oral and/or media report that addresses all the design challenge items selected by their teacher (see Appendix A).

Appendix A: Student Design Challenge and Investigation

Name:_____ Teacher:_____ Class: _____

Precision Movement Game Design Challenge

You (or your team) will research, design, and build an electronic precision movement game. Only the materials and tools listed/provided may be used to complete this challenge. Your game must challenge the user to maintain precise movement as they complete a test that becomes more challenging as they move from the beginning to the end. The tester must sound a buzzer when the user has reached his/her skill limit. You must also name your game (e.g., bomb squad trainer, injury recovery tester, etc.), and complete a report when you are done.

Work through the following sequence of tasks as you complete this design challenge:

- record and review the tools and materials that are available for this design challenge;
- research and record information on simple direct current (DC) buzzer circuits and precision movement games;
- form hypotheses, based on your research, regarding potential solutions to your design challenge/investigation;
- list your top ideas for solving the design challenge, sketch out the two that seem the most promising, record reasons for picking them (e.g. how it looks, how it works, and its environmental impact) and submit these items to your teacher for approval;
- design a set of plans for building a precision movement game, and a develop a fair test for your product;
- build your precision movement game using the materials and tools provided;
- carry out your test and determine if the parts of your electrical system and game work together well enough to solve your design challenge; record your observations, data, and results as you carry out your investigation;
- If improvements are necessary and if time permits redesign your game and re-test it to determine if your changes were successful; record all final data, and observations;
- in groups, discuss and record what went well with your design process and tests, what changes were made, why they were needed, and what you would do differently if given another opportunity.

Following this process, you will be required to complete further research and submit or present a report to your teacher. Your report must address all items checked off below.

○ Use vocabulary that includes the correct use of scientific and technological terms that address electrical systems.

○ List the parts of your precision movement game and describe how they function together.

○ Brainstorm, research, and record information and ideas involving electrical systems and their connections to individuals, society, the economy, and the environment.

○ Propose a course of action that could be taken, using your game, to help injured children who are working on regaining precise hand movements.

○ Report on what went well during your technological problem solving process and your test, what changes were made (if any), why the changes were needed (if applicable), and what you would do differently if you could try this again (if applicable).

Appendix B: Assessment Rubric (Assessment **of** Learning)

This rubric was developed from the Ontario Curriculum Grades 1-8 Science and Technology, Revised 2007 document.				
	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding (K&U) – Subject-specific content acquired in each grade (knowledge), and the comprehension of its meaning and significance (understanding)				
	The Student:			
1. Knowledge of content (e.g., facts and terminology related to electrical circuits; safe use of tools and materials)	demonstrates limited knowledge of content	demonstrates some knowledge of content	demonstrates considerable knowledge of content	demonstrates thorough knowledge of content
2. Understanding of content (e.g., concepts, ideas, and processes involving electrical circuits)	demonstrates limited understanding of content	demonstrates some understanding of content	demonstrates considerable understanding of content	demonstrates thorough understanding of content
Thinking and Investigation (T&I) – The use of critical and creative thinking skills and inquiry problem solving skills and/or processes				
	The Student:			
3. Use of initiating and planning skills and strategies (identify appropriate items to research, and locate resources that are relevant to the investigation and design challenge)	uses initiating and planning skills and strategies with limited effectiveness	uses initiating and planning skills and strategies with some effectiveness	uses initiating and planning skills and strategies with considerable effectiveness	uses initiating and planning skills and strategies with a high degree of effectiveness
4. Use of processing skills and strategies (e.g., performing and recording, gathering evidence and data, observing, manipulating materials and using equipment safely, ... proving) to design and fabricate a precision movement game that will emit a sound, over a range of difficulties, to determine the abilities of the user	uses processing skills and strategies with limited effectiveness	uses processing skills and strategies with some effectiveness	uses processing skills and strategies with considerable effectiveness	uses processing skills and strategies with a high degree of effectiveness
5. Use of critical/creative thinking processes, skills, and strategies (e.g., analysing, interpreting, problem solving, evaluating, forming and justifying conclusions on the basis of evidence) to complete a fair test to determine if the prototype meets the design requirements for this task	uses critical/creative thinking processes, skills, and strategies with limited effectiveness	uses critical/creative thinking processes, skills, and strategies with some effectiveness	uses critical/creative thinking processes, skills, and strategies with considerable effectiveness	uses critical/creative thinking processes, skills, and strategies with a high degree of effectiveness
Communication (Com.) – The conveying of meaning through various forms				
	The student:			
6. Expression and organization of ideas and information in oral, visual, and/or written forms (e.g.,	expresses and organizes ideas and information	expresses and organizes ideas and information	expresses and organizes ideas and information	expresses and organizes ideas and

complete a report that is organized in a clear, logical manner and include diagrams and models where appropriate)	with limited effectiveness	with some effectiveness	with considerable effectiveness	information with a high degree of effectiveness
7. Communication for different audiences and purposes in oral, visual, and/or written forms (accurately describe the steps taken to solve the design challenge and the learning that he/she acquired from this unit and use an appropriate form for the selected audience, e.g., teacher, or teacher and classmates)	communicates for different audiences and purposes with limited effectiveness	communicates for different audiences and purposes with some effectiveness	communicates for different audiences and purposes with considerable effectiveness	communicates for different audiences and purposes with a high degree of effectiveness
8. Use of conventions, vocabulary, and terminology (e.g., current, battery, circuit, transform, and energy) in oral, visual, and/or written forms	uses conventions, vocabulary, and terminology with limited effectiveness	uses conventions, vocabulary, and terminology with some effectiveness	uses conventions, vocabulary, and terminology with considerable effectiveness	uses conventions, vocabulary, and terminology with a high degree of effectiveness
Application (App.) – The use of knowledge and skills to make connections within and between various contexts				
	The student:			
9. Application of knowledge and skills (e.g., concepts and processes, use of equipment and technology, investigation skills) in familiar contexts	applies knowledge and skills in familiar contexts with limited effectiveness	applies knowledge and skills in familiar contexts with some effectiveness	applies knowledge and skills in familiar contexts with considerable effectiveness	applies knowledge and skills in familiar contexts with a high degree of effectiveness
10. Making connections between society, science, technology, and the environment regarding the design solution selected and its impacts on people, other living things, and the environment	connects science, technology, society, and the environment with limited effectiveness	connects science, technology, society, and the environment with some effectiveness	connects science, technology, society, and the environment with considerable effectiveness	connects science, technology, society, and the environment with a high degree of effectiveness
11. Proposing courses of practical action to deal with problems relating to science, technology, society, and the environment (e.g., how the games could be used to help injured children during their physiotherapy)	proposes courses of practical action of limited effectiveness	proposes courses of practical action of some effectiveness	proposes courses of practical action of considerable effectiveness	proposes highly effective courses of practical action

Appendix C: Assessment of Learning, Grade Sheet.

Teacher's Record: Assessment **Of** Learning Use with the Assessment Rubric	Teacher: ____________________ Class: ______ Unit: __________________________ Date: ___/___/___										
	Knowledge and Understanding		Thinking and Investigation			Communication			Application		
Student's Name	1	2	3	4	5	6	7	8	9	10	11

Appendix D: Assessment For Learning
Continuum For Technological Problem Solving

Beginning > Exploring > Emerging > Competent > Proficient			
Initiating and Planning			
The student:			
(A) recognizes a practical problem in a given context	identifies practical problems to solve in the immediate environment	identifies practical problems to solve in the local community	identifies practical problems to solve
(B) with support (e.g., as a class or in small groups), brainstorms possible solutions to a practical problem	with support (e.g., as a class or in small groups), generates a list of possible solutions to a practical problem and determines which are realistic in the classroom and/or the real world	identifies possible solutions to a practical problem and explains how each might solve the problem	identifies possible solutions to a practical problem and prioritizes them with regard to their potential for solving the problem
(C) with support (e.g., as a class or in small groups), selects one possible solution to implement	selects a possible solution to implement	selects a possible solution to implement, and provides reasons for the choice	selects a possible solution, and provides reasons for the choice that take into account considerations such as function, aesthetics, environmental impact
(D) with support (e.g., as a class or in small groups), makes a simple plan to carry out the solution	makes a simple plan (individually or in small groups), including simple drawings and/or diagrams, to carry out the solution	outlines (individually or in small groups) the steps of a plan, including labeled drawings and/or diagrams, to solve the problem	outlines in detail, including technical drawings and/or diagrams, each step of a plan to solve the problem
(E) with support (e.g., as a class or in small groups), establishes a limited number of criteria for evaluating proposed solutions to the problem	with support (e.g., as a class or in small groups), establishes a limited number of criteria for evaluating proposed solutions to the problem	contributes to establishing general criteria for evaluating objects or devices designed to solve the problem	contributes to establishing general criteria for evaluating objects or devices designed to solve
Performing and Recording			
The student:			
(F) with support (e.g., as a class or in small groups), carries out the pre-determined plan	with support (e.g., as a class or in small groups), carries out the pre-determined plan	carries out the pre-determined plan (individually or in pairs or small groups)	carries out the pre-determined plan
(G) with support, designs, builds, and tests (on the basis of pre-determined criteria) a device or an object to solve the problem	with support, designs, builds, and tests (on the basis of pre-determined criteria) a device or an object to solve the problem	designs, builds, and tests (on the basis of pre-determined criteria) a device or an object to solve the problem	designs, builds, and tests (on the basis of pre-determined criteria) a device or an object to solve the problem

(H) records results using pictures and/or tally charts	records results in a variety of ways, such as sentences, simple drawings, diagrams, and/or charts, and/or charts	records results in a variety of ways, such as sentences, drawings, labelled diagrams, graphs	records results in a variety of ways, such as sentences, technical drawings, labeled diagrams, graphs, and/or charts
Analyzing and Interpreting			
The student:			
(I) with support, identifies how well the chosen solution solved the practical problem, using the pre-determined criteria	identifies how well the chosen solution solved the practical problem, using the pre-determined criteria	explains how well the chosen solution solved the practical problem, and suggests possible changes to the criteria and the solution	explains how well the chosen solution solved the practical problem, using qualitative and/or quantitative data, and suggests possible changes to the criteria and the solution
(J) with support, suggests something that might be changed about the solution to the problem identifies some things that could be done differently to improve the solution to the problem	identifies and explains what changes could be made to the plan and how to improve the solution to the problem, and gives reasons for the changes	identifies and explains what changes could be made to the plan and the testing process, and how to improve the solution to the problem, and gives reasons for the changes	identifies and explains what changes could be made to the plan and the testing process, and how to improve the solution to the problem, and gives reasons for the changes
(K)	identifies some possible beneficial and non-beneficial impacts of the chosen solution for himself/herself or others	identifies the effects of the chosen solution on himself/herself, others, and/or the environment, considering things such as cost, materials, time, and/or space	identifies the effects of the chosen solution on himself/herself, others, and/or the environment, considering things such as cost, materials, time, and/or space, and suggests ways in which undesirable effects could be lessened or eliminated
Communicating			
The student:			
(L) describes orally, and/or using drawings, pictures, and/or simple sentences, the problem and how he or she solved it	describes orally, and/or using drawings, pictures, and/or simple sentences, the problem and how he or she solved it	describes orally, and using labelled drawings and diagrams, charts, graphs, and/or written descriptions, the problem and how he or she solved it	describes orally, and using labelled drawings and diagrams, charts, graphs, and/or written descriptions, the problem and how he or she solved it
(M) uses grade-appropriate science and technology vocabulary correctly	uses grade-appropriate science and technology vocabulary correctly	uses grade-appropriate science and technology vocabulary correctly	uses grade-appropriate science and technology vocabulary correctly

Appendix E: Assessment As Learning, Student Self-Assessment Log

What Can I Do Well? What Can I Do Better? What is My Plan?

Name:_____ Teacher:_____ Class: _____

Self-Assessment (SA):
1. I have reached this goal.
2. I am getting there.
3. Help! I am struggling with this.

Peer-Assessment (PA):
1. You have reached this goal.
2. You are getting there.
3. You have not reached this goal.

Responsibility For Learning (RFL).
1. No assistance is needed. I have achieved what this task requires.
2. I will reach this goal by asking for direct support from my teacher.
3. I will reach this goal by asking for support from my peers.
4. I will reach this goal by asking for support from my caregiver(s).
5. I will reach this goal by working on it independently.

These descriptors reflect skills that have reached the Competent level on the "Continuum for Technological Problem-Solving Skills."

A. I can identify a practical design problem that needs to be solved.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

B. I can come up with some solutions to the design problem, and I can organize them from first choice to last.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

C. I can pick my best idea and give reasons for my choice.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

D. I can make a set of plans that describes each step needed to build my project, and my plans include labeled diagrams and/or diagrams where needed.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

E. I can contribute ideas on how my project should be graded.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

F. I can carry out my plan individually, in pairs, or in groups.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

G. I can design build and test a device that solves my design problem.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

H. I can record my results in a variety of ways, such as sentences, drawings, labeled diagrams, graphs, and/or charts.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

I. I can explain how well I solved the design problem, and suggest possible changes to the criteria and my solution to the design problem.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

J. I can identify and explain what changes could be made to my plan, how to improve my solution to the design problem, and give reasons for the changes.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

K. I can identify the good and bad effects of my solution on myself, others, and/or the environment (including cost, materials, time, and/or space).

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

L. I can give an oral presentation that describes what my design problem was and how I solved it. I can include labelled drawings and diagrams, charts, graphs, and/or written descriptions in my presentation.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

M. I can use the science and technology vocabulary we have learned, correctly.

SA:_____ PA:_____ RFL:_____ Date Achieved:_____

Notes:

Appendix F: Assessment For Learning, Tracking Sheet

Teacher's Record: Assessment **For** Learning, Technological Problem Solving Skills Continuum

Teacher: ______________________ Class: ___________ Unit: ___________________________ Date: ____/____/____

Suggested Assessment Codes: B - beginning, Ex - exploring, Em - emerging, C - competent, P - proficient

	Initiating and Planning					Performing and Recording			Analysing and Interpreting			Communicating	
Student's Name	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**

Appendix G: Support for Assessment and Evaluation

Assessment as/for/of Learning

It is the goal of the OCTE Elementary Committee to support their members in the development of these skills. This year the focus is on providing feedback (assessment for and as learning) using the Ministry's "Continuum for Technological Problem Solving Skills" (Science and Technology Grades 1-8, pp. 17-18) Please note that only the Ministry's "Achievement Chart -- Science and Technology, Grades 1-8" (Science and Technology Grades 1-8, pp. 26-27) is to be used for assessment of learning.

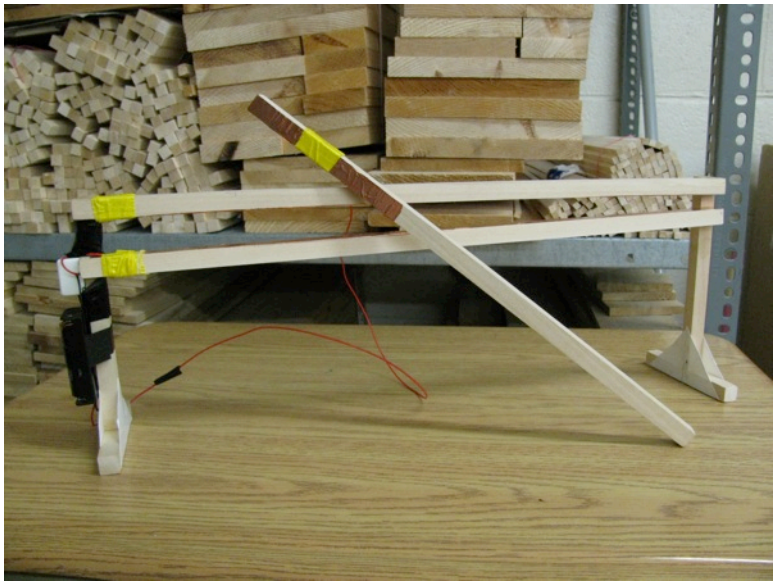
A summary of the three forms of assessment addressed in the Ministry of Education's Growing Success (2010) document is as follows:

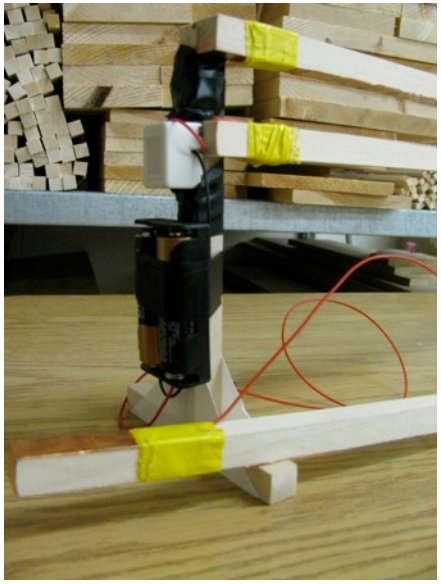
- assessment for learning involves generating feedback about your students' progress that is shared with them before assessing for report card grades;
- assessment of learning is when you generate marks/levels for your report cards;
- assessment as learning, when developed fully, is when students provide their own feedback and assessment (peer and/or self) regarding their learning; students use this information to set learning goals, and to select appropriate learning strategies for their success.

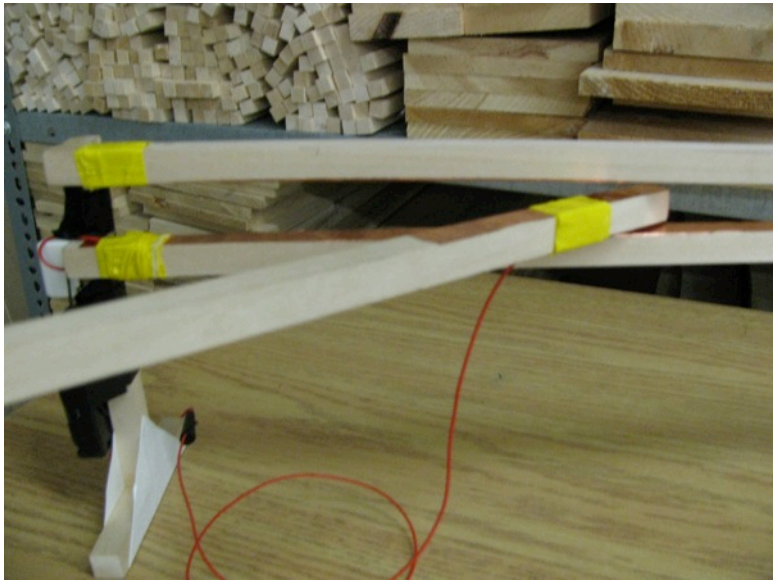
Here are some suggestions to support the implementation of "Assessment as Learning" in your program; they are as follows:

1. Provide your students with a copy of "Appendix E: Assessment as Learning, Student Self-Assessment Log" and refer to applicable statements (see statements A-M) for discussion, before each of these items are addressed.
2. Ensure that the learning goal for each item is clearly understood by your students. Use student friendly language wherever possible.
3. Provide opportunities for self/peer assessment (move from structured to student directed as your students develop this skill).
4. Discuss or refer to successful and unsuccessful work (exemplars, or student generated materials) to provide benchmarks for your students' self/peer assessments.
5. Collect and review your students' "Assessment as Learning, Student Self Assessment Log." Make note of who needs additional support. Schedule time for these students into your next lesson (or provide opportunities for extra help, if possible).
6. Use your students' self/peer assessments to determine if a task requires modification to support successful learning.
7. Refer to pp. 27-36 in the Growing Success document for complete details. Reference: Ontario. Ministry of Education. (2010). *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools, First Edition, Covering Grades 1-12.* Toronto: Author. ISBN 978-1-4435-2284-7 (Print), ISBN 978-1-4435-2285-4 (PDF) (Rev.), ISBN 978-1-4435-2286-1 (TXT), © Queen's Printer for Ontario.

Appendix H: Samples







Photographs by: Darren Foy