Connecting to Skilled Trades Through Experiential Learning
Lesson Plan: Plumbing Task 1:

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Project Purpose/Audience:

Audience: Grade 7 and Grade 8 students

Purpose: Students will have the opportunity to explore plumbing as an avenue for learning, problem solving and critical thinking. Students will be engaged in actively exploring and using plumbing equipment learn some introductory skills required to solve problems as they relate to the plumbing side of constructions and skilled trades. Students will gain a deeper understanding of the materials and skills required to build, create and fix plumbing issues. Students will also explore the pathway and education requirements to pursue a career in plumbing.

Lesson Objectives:

- Students will participate in Experiential Learning opportunity related to Plumbing and reflect on connections to pathways and goal setting.
- Students will self-assess their understanding of some basic plumbing tools and materials, as well as the importance of understanding plumbing as it relates to exploring Skilled Trades
- Students will create a personal design and reflect on the planning and application process

Student Learning Goals:

Students will…

❖ Explore plumbing tools and materials to design and plan the construction of their own initial

So that…

❖ A hands on experience leads to deeper understanding and connection to how plumbing contributes to construction, daily living, and well-being

❖ Students will be able to connect to pathway options and career-life planning opportunities

Materials:

- Ruler, pencil, 1 cm grid paper
- Pex Tube, Various connectors (elbow, T-joint, straight), pipe cutter (small)
- Rubric for student self-assessment/teacher-assessment https://docs.google.com/document/d/1TmzhZClTBAfjcWYoFXPnpeHlab5OqL19iLx6ABNwGE8/edit?usp=sharing
- Appendix photos

Accommodations:

Refer to student IEP and class profile to ensure all students will have the supports they require to work towards the learning goals.

Lesson Outline:

Participate (what?):

- Brainstorm (small group – students in groups of 4)
  What is plumbing? How do we move fluid from one place to another? What problems might a plumber have to solve in order to effectively do his/her job? Share responses as a whole class.

- Explore and examine plumbing materials and tools. Show groups of students picture in appendix. Ask groups to discuss tool names and purpose. (See Appendix 1)
  Introduce PEX piping and a pipe cutter. Explain to students that they are going to be designing, measuring, and cutting PEX pipe to fit into various joints to create their own letter.
- Using 1cm grid paper, students will design a letter of the alphabet of their choosing (suggestion to choose their first initial – or teacher can randomly select – avoid X) Discuss the planning process to determine what types of joints students will need to make their letter (See Appendix 2).
- To design: students should consider the size of their letter. Try to use most of the 1 cm grid paper to create the outline of their letter. This will be used as their own template once their letter has been completed, so students are encouraged to make the design a "bubble letter" the same width as the PEX pipe being used. Students will also need to include the joint fittings for their letter. (See Appendix 3)
- Once the design has met teacher approval, students may collect the necessary materials and begin measuring, cutting and creating their letters.

Reflect (so what?):

- Students will reply to prompts to connect their design to how a plumber might use the tools and skills to perform his/her job. What was successful and what was challenging? Why is measuring important? What obstacles might you face if you chose the wrong joints, or no joints at all?
- Handout to for students to explore how Plumbing connections to Global Competencies: https://docs.google.com/document/d/1sv1FcwVsLsVfrq0pWJGNXcdoY5BlTBYLhdpqUFcXBO0/edit?usp=sharing

Apply (now what?):

- Students will complete a self-assessment evaluation on the design and construction process.

https://docs.google.com/document/d/1tdv0H5MrF373aoGaMJoCcf56icGnQkS2KXHbG5DuqX0/edit?usp=sharing

- Students will document and record their experiences and reflections in their IPP's on career cruising using the following questions (as per OCTE):

- Who am I?
- What are my opportunities?
- Who do I want to become and what types of problems do I want to solve?
- What would I like to investigate, experience or explore further?
- What is my plan to work towards my goals?

http://www.edu.gov.on.ca/eng/document/policy/cps/CreatingPathwaysSuccess.pdf

Key Drivers:

Curriculum:

A) SCIENCE: UNDERSTANDING STRUCTURES AND MECHANISMS: SYSTEMS IN ACTION

OVERALL EXPECTATIONS- By the end of Grade 8, students will:
1. assess the personal, social, and/or environmental impacts of a system, and evaluate improvements to a system and/or alternative ways of meeting the same needs;
2. investigate a working system and the ways in which components of the system contribute to its desired function;
3. demonstrate an understanding of different types of systems and the factors that contribute to their safe and efficient operation.

SPECIFIC EXPECTATIONS
2.4 use technological problem-solving skills (see page 16 of Ontario Curriculum) to investigate a system (e.g., an optical system, a mechanical system, an electrical system) that performs a function or meets a need. Sample problem: Create a system that will move water from one place to another. Describe the function of each component part, and examine the effects of making a change to one or more of the components. Sample guiding questions: What purpose or need does your device fulfil? When you tested your device, which component or components worked as intended? Which did not? Why do you think the problem occurred? Predict what will happen if you remove or change the size or direction of one or more of the components.
3.2 identify the purpose, inputs, and outputs of various systems (e.g., a plumbed water delivery system – purpose: to move water from one place to another; input: piping, water, pump; output: water somewhere there wasn't any).

B) SCIENCE: UNDERSTANDING MATTER AND ENERGY: FLUIDS

OVERALL EXPECTATIONS- By the end of Grade 8, students will:
1. analyse how the properties of fluids are used in various technologies, and assess the impact of these technologies on society and the environment;
2. investigate the properties of fluids; 3. demonstrate an understanding of the properties and uses of fluids.

SPECIFIC EXPECTATIONS
2.1 follow established safety practices for using apparatus, tools, and materials (e.g., use piping, connections, pumps, and tools for the purposes for which they were designed)
2.4 investigate applications of the principles of fluid mechanics (e.g., in aeronautical research, shipping, food services, **plumbing**, hydrodynamic engineering)
2.5 use scientific inquiry/experimentation skills to identify factors that affect the flow rates of various fluids (e.g., how rate of flow changes with the use of different diameter piping or different pump speeds)
2.6 use technological problem-solving skills (see page 16) to design, build, and test devices that use pneumatic or hydraulic systems Sample problem: Design and build a piping system to transfer a liquid from one location to another.

C) MATH: GEOMETRY and SPATIAL SENSE: GEOMETRIC RELATIONSHIPS

– determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, geoboard), relationships among area, perimeter, corresponding side lengths, and corresponding angles of similar shapes

– determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, protractor) and strategies (e.g., paper folding), the angle relationships for intersecting lines and for parallel lines and transversals

Pathways/Education and Career Life Planning:

Refer to the Pathways to Success document:
http://www.edu.gov.on.ca/eng/document/policy/cps/CreatingPathwaysSuccess.pdf
Various secondary school options will be examined to determine elective courses in grade 9 that can provide opportunity for a variety of SHSM, OYAP and Co-Op opportunities:
https://www.hwdsb.on.ca/secondary/programs/shsm/
Apprenticeship opportunities also can be found at:
https://www.ontario.ca/page/apprenticeship-ontario

Global Competencies:

See attached supporting document from the Ontario Council for Technology Education (OCTE)
https://docs.google.com/document/d/19P5D1uO8KhTMip6_Z5Ee3_XQ7vN7XU4S/edit

Well-Being:

Assessment and Evaluation:

Student Self-Assessment

1) Student Reflections

https://docs.google.com/document/d/1TmzhZClTBAfjcWYoFXPnpeHlab5OqL19iLx6ABNwGE8/edit?usp=sharing

2) Student/Teacher: Global Competencies

https://docs.google.com/document/d/1sv1FcwVsLsVfrq0pWJGNXcdoY5BITBYLhdpqUFcXBO0/edit?usp=sharing

3) Reflections: Plumbing Tools in Schools – Grow and Glow:

https://docs.google.com/document/d/1tdv0H5MrF373aoGaMJoCcf56icGnQkS2KXHbG5DuqX0/edit?usp=sharing

Planning/Organization/Process:

Community Partners:

- HWDSB Specialist High Skills Major (https://www.hwdsb.on.ca/secondary/programs/shsm/)

- Mohawk College Skilled Trades Programs (https://www.mohawkcollege.ca/programs/marshall-school-of-skilled-trades-apprenticeship)
- Local Secondary School / Tech Department

Ontario Youth Apprenticeship Program OYAP (https://oyap.com/splash/)

Resources:

Tools and Equipment:

- PEX tube
  https://www.lowes.ca/product/pex-pipe-crimp-fittings/34-in-x-50-ft-white-pex-pipe-tubing-811730
  https://www.homedepot.ca/product/sharkbite-1-2-inch-x-100-ft-pex-tubing-coil-in-white/1000144862
- Plumbing Joints
  https://www.homedepot.ca/product/sharkbite-1-2-inch-90-degree-elbow/1000792286?rrec=true
  https://www.lowes.ca/product/pex-pipe-crimp-fittings/waterline-12-in-pex-barb-x-12-in-push-to-connect-dia-90-degree-angle-push-fittings-811683
- Pipe Cutters
  https://www.homedepot.ca/product/sharkbite-1-2-inch-to-1-inch-pex-pipe-cutter/1001012687
  https://www.lowes.ca/search?query=pex+cutter&sort=score%3Adesc&tab=products-tab

Videos:

Intro to trades
https://drive.google.com/drive/folders/1uQTXZph_Z9Cla2go7zKX1mRbjKGlvAL_

Specialist High Skills Major
https://drive.google.com/drive/folders/1uQTXZph_Z9Cla2go7zKX1mRbjKGlvAL_

Closing the Skill Gap, with Mike Rowe
https://drive.google.com/drive/folders/1uQTXZph_Z9Cla2go7zKX1mRbjKGlvAL_

OYAP
https://drive.google.com/drive/folders/1uQTXZph_Z9Cla2go7zKX1mRbjKGlvAL_

Women in Trades
https://drive.google.com/drive/folders/1uQTXZph_Z9Cla2go7zKX1mRbjKGlvAL_

Websites:

Connections to home learning and pre/post reading:

Bob Villa: https://www.bobvila.com/articles/pex-pipe/
(This website is particularly useful for pre-reading and home learning. Students can view and learn about a variety of specific materials and tools. Students can begin a creative thinking process by see how tools and materials can be used to solve problems.)

Plumbing Zone:
https://www.plumbingzone.com/f90/how-can-technology-make-plumbing-easier-73154/
(This website has connections to Augmented Reality. Students will be able to explore how plumbing connects to local community and global development through augmented reality applications. Great for home learning and extension opportunities)

Edge Factor: https://edgefactor.com/V5/pages/Welcome.aspx
(This website has fantastic links to extend home-based learning and allows students to explore various trades. Opportunities to explore global competencies and well-being within skilled trades are provided through developing a deeper understanding for problems that skilled trade workers solve.)

Safety:
Please check local safety requirements for students to use a pipe cutter. Parent information and permission forms will be required.
Required PPE: N/A
SafeDocs:

Elementary SAFEDocs
https://www.octe.ca/en/resources/resource-folder/elementary-safedoc

List of References to consider:

Community Connected Experiential Learning, Draft, 2016
http://www.edu.gov.on.ca/eng/general/elemsec/job/passport/CommunityConnected_ExperientialLearningEng.pdf

Pathways to Success, Policy and Program Requirements, Kindergarten to Grade 12, 2013
http://www.edu.gov.on.ca/eng/document/policy/cps/CreatingPathwaysSuccess.pdf

Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools, First Edition, Covering Grades 1 to 12, 2010
www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

21st Century Competencies: Foundation Document for Discussion. Phase 1:Towards Defining 21st Century Competencies for Ontario, Winter 2016 Edition, 2016
http://www.edugains.ca/resources21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf

Learning for All – A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12, 2013
http://www.edu.gov.on.ca/eng/general/elemsec/speced/LearningforAll2013.pdf

The Ontario Curriculum, Grade 1 - 8: Science and Technology
http://www.edu.gov.on.ca/eng/curriculum/elementary/scientec18currb.pdf

Ontario.ca
https://www.ontario.ca/page/list-skilled-trades-ontario#section-2

APPENDICES:

Appendix 1: Plumbing Tools and Materials (Pipes, Tools and Connector Joints)

Appendix 2: Joints

Appendix 3: Example Letters with Pipes and Connector Joints