DESIGNING A BRIGHTER FUTURE

RESOURCES FOR EDUCATORS

These educational resources have been designed to focus on the energy crisis which is a global problem. Thus, each activity has a common theme of the environment and energy. However, there is also an integration of other school subjects, including history, arts, English, science, technology, engineering, geography and mathematics.

Emphasis is placed on the contributions of a diversity of engineers and scientists to emphasize that all passionate people (regardless of gender, age, ethnicity or socio-economic status) can pursue studies and careers in STEM (science, technology, engineering and mathematics).

GRADE LEVELS

The four units can be used individually or as a whole program of study. It is recommended that the units be used in the order presented, but this is only a suggestion and some elements should be modified based on student needs and learning objectives. To this end, adaptations and resources are indicated for the following grade levels:

- Grades 4 - 8
- Grades 9+

Ingenium
Canada's Museums of Science and Innovation
Musées des sciences et de l'innovation du Canada

IngeniumCanada.org

Canada

These resources were created through a collaboration between Ingenium and a University of Ottawa doctoral candidate, Janelle Fournier.

SPARK THE INTEREST OF A DIVERSITY OF STUDENTS

The educational resources use an authentic problem[1], that being the energy crisis, to engage a diversity of students in STEM learning.

Girls, in particular, want hands-on activities[2,3] where they can solve societal problems. They seek opportunities to make a difference in society[4]. In undertaking the activities included in these resources, girls (but also boys and students with other gender identities) will be at the centre of their learning[5] and will have opportunities to reason, reflect, ask questions, persist and solve problems[3,6.] The goal is to engage them in their learning and potentially to spark an interest of a diversity of genders of students in STEM.

Lexicon

Gender diversity
"Equitable or fair representation between genders, including non-binary gender categories" (Ontario Public Service, 2018, p. 6).

Gender identity
"A person's internal and deeply felt sense of being a man, a woman, both, neither or having another identity on the gender spectrum" (Ontario Public Service, 2018. p. 7).

AIMING FOR GENDER BALANCE

Gender diversity is particularly important in STEM, as women continue to be underrepresented in these professions. Energy remains one of the most unbalanced sectors where women represent only one fifth of the workforce[7]. "An increase in the participation of women would help boost the economic growth of the energy sector and the Canadian economy as a whole"[8]. The use of these resources can introduce students of all genders to the energy sector and can instill a passion for the field, which, in turn, can be beneficial for society.

[1] Kelley & Knowles, 2016
[2] Kekelis et al., 2014
[3] Reinking & Martin, 2018
[4] Mujawamariya et al., 2014; UNESCO International Bureau of Education, 2017
[5] Meyer et al., 2016
[6] Wang, 2012
[7] Natural Resources Canada, 2018
[8] Natural Resources Canada, 2018, p. 36

INTEGRATING ENGINEERING

Units 3 and 4 require the integration of engineering into the classroom, using the design process. Engineers employ the design process to solve problems with multiple solutions[9].

As they begin the design process, students will be asked to:

1. Define the problem;
2. Explore and gather relevant information;
3. Design ideas to solve the problem;
4. Create a prototype;
5. Test it; and
6. Evaluate and edit the prototype.

What is engineering?

Engineering is a systematic and often iterative approach to designing objects to meet human needs and wants (National Academy of Engineering and National Research Council, 2009).

For more details, please refer to Appendix 1. Through this process, students will use their prior knowledge of science, mathematics and technology, as well as their life experiences to solve energy problems[10].

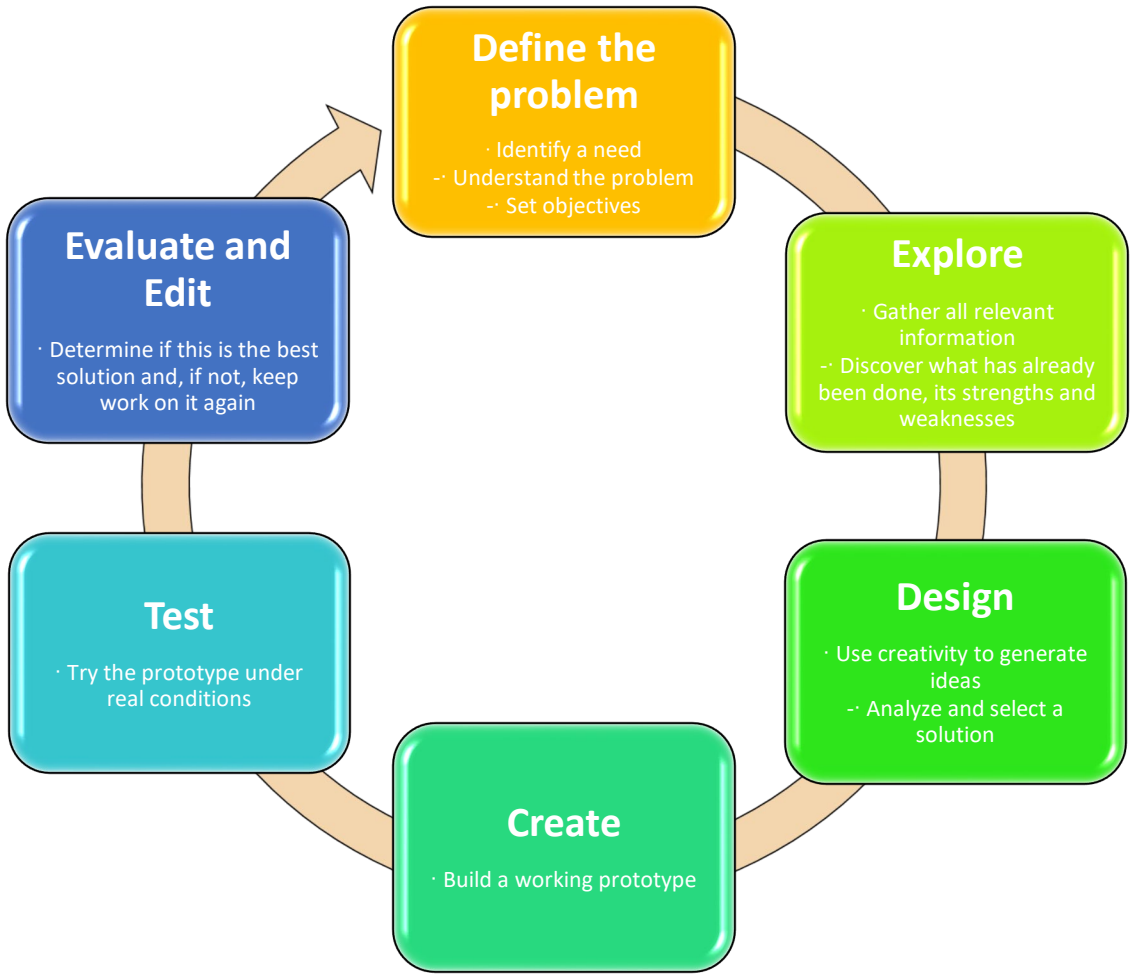
The use of the design process introduces students to engineering and provides an opportunity to discuss the tasks and responsibilities of engineers, as well as explore possible careers in engineering. Integrating engineering education in the classroom is important in attempting to achieve gender balance in the engineering profession.

Did you know that in 2018, women accounted for 13.5% of professional engineers in Canada (Engineers Canada, 2019)?

[9] Khandani, 2005
[10] Bull et al., 2009; Kelley, 2010; Meyrick, 2011

APPENDIX 1 – DESIGN PROCESS

The design process, used by engineers, can be used when a person tries to solve a problem that has multiple solutions. There are six steps to the design process.



Adapted from Khandani (2005); The Works Museum (2016)

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