Board **26 November 2019**

Report No. 19-116

Evidence of Practice

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PURPOSE:

1. To present information to the board of trustees on a school's experience in demonstrating evidence of practice in the area of the Culture of Innovation.

CONTEXT:

2. Students in the West Carleton Secondary School courses, TEJ3M (Grade 11) 'Introduction to Computer Engineering' and TEJ4M (Grade 12) 'Computer Engineering', in addition to learning how to code, also learn how to create printed circuit boards (PCBs) which allows them to build hardware while earning a credit.

   Many schools offer computer programming, but actually building circuit boards is not common.

KEY CONSIDERATIONS:

3. The courses are part of the 'Information and Technology' Specialist High Skills Major (SHSM) at West Carleton Secondary School. Students in a SHSM earn a specialist designation on their graduation certificate if they complete all of the components, which include the following:

   - Bundle of 7 - 9 credits (grade 11 & 12 including 2 Coop)
   - Industry Sector recognized certifications (compulsory & electives)
   - Experiential Learning (work experience & job shadowing)
   - Reach Ahead Opportunities (post-secondary)
   - Essential Skills & Work habits
   - Innovation, Creativity, Entrepreneurship

   The OCDSB currently runs 42 SHSM programs across the district. Schools receive additional funding from the Ministry to offer these programs which help cover costs related to equipment purchases, certifications, and materials.

   The initiative developed in the following way:
   - Students were invited to visit a PCB (Printed Circuit Board) Verification & Testing company, DA Integrated.
   - Students toured the facility and heard from employees.

- Students were then shown a presentation focused on how they created PCBs and were provided guidance to allow them to build one themselves.
- Back in the classroom students designed and tested custom made PCBs which they then programmed.
- PCB design and manufacturing became a keystone part of the grade 12 engineering course which continues today.

The initiative has taken place over three years and has included the following elements:

- site visit (facilities tour/employee discussion panel);
- a project launch by the community partner;
- industry standard software taught in the course to satisfy this project;
- real product manufacturing; and
- the project has become a foundational part of the grade 12 course.

Examples of projects include:

I. "Whack a mole" game
   Students made a game board with 16 lights and 16 buttons that they programmed to be lit up in an increasingly fast game that lit up a button to be "whacked" by pushing the corresponding button.
II. Robot arm controller base station and remote control
   Students repurposed an older robot arm by building a modern control circuit that could be remotely controlled from a wireless controller (also designed and built).
III. "Advanced Useless Box"
   This will be demonstrated at the Board meeting.

Student success is seen in:

- extremely high student engagement;
- every student having a board manufactured and the ability to see the product of their work; and
- the opportunity for students to put on a demo for the community partner to demonstrate their hard work.

Teacher practice shifted as a result of observing the impact on student outcomes. Staff reported as being more open to embrace a project-based approach to instruction.

The factors contributing to the success are:

- connections to real-life problem and purpose;
- knowledge that they are learning real industry skills and software; and
- that it creates fun and approachable challenges.

Some of the challenges faced were:

Initially:

- creating the partnership in the first place, reaching out to industry and then developing a plan;
- learning the best way to approach teaching this software; and

- finding a funding formula that was achievable for both West Carleton Secondary School and DA Integrated. This ended up being a combination of SHSM funding and DA Integrated offering some contributions (as the costs were approximately $1,500).

Longer term:

- finding an achievable way to replicate this year after year regarding cost, materials and safety;
- by moving to an 'in-house' model, the school was able to have students manufacture their own simple circuit board, but still send away group project boards to have them formally manufactured. The result is a smaller number and much lower cost per board etched in-house in the school's chemistry lab; and
- typically the cost is now less than $500 per year, each student still receives a board to take home and has seen the full manufacturing/design process for formal circuit boards.

This initiative was successful in improving outcomes for students by enabling them to learn about both software and hardware simultaneously. Students report very high levels of engagement, and some students have gone on to study in related fields in their post-secondary studies.

RESOURCE IMPLICATIONS:

4. Start-up costs are approximately $1,500, on top of the $500 a year to run the program.

STRATEGIC LINKS:

5. This initiative linked with our strategic objectives in the areas of Innovation. Additionally, many of the Exit Outcomes are demonstrated such as: Goal-oriented, Innovative/Creative, Collaborative, Globally Aware, Resilient, Ethical Decision-makers, Academically Diverse, Effective Communicators and Critical Thinkers.

GUIDING QUESTIONS:

- How might the practice be expanded to other schools in the district?
- What supports or professional learning would be required?

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