

# **THE ENGINEERING IDEAS CLINIC EXPERIENCE**

**W. Bishop, A. Trivett, J. Grove, A. Hurst, B. Mantin,  
J. Baleshta, S. Mohamed, C. Hulls, C. Rennick,  
M. Bristow, M. Robinson, S. Bedi, J. Rathlin**



# An Introduction to the Ideas Clinic Experience

- Experiential learning is a degree-level expectation of the undergraduate curriculum at the University of Waterloo
- The **Ideas Clinic Experience** was created by the Faculty of Engineering to introduce experiential learning into courses:
  - » Hands-on, engaging activities
  - » Designed to achieve expected learning outcomes
  - » Carefully integrated into programs
    - Horizontal integration (i.e., integration across disciplines)
    - Vertical integration (i.e., integration across program years)
  - » Students work together in a multi-disciplinary setting



# Panel Session

- Our panelists are the following:
  - » **Jason Grove** (Chemical Engineering)
  - » **Jen Rathlin** (Mechanical and Mechatronics Engineering)
  - » **Ada Hurst** (Management Sciences)
  - » **Samar Mohamed** (Centre for Teaching Excellence)
- Each panelist will briefly introduce an experiential learning activity that they have used in the past year
- This will be followed by questions addressed to our panelists
  - » Feel free to join the discussion at any time by raising your hand



# Coffee Maker

## 1300 Student Pilot Project

- 1A students from Chemical, Civil, Computer, Electrical, Environmental, Geological, Management, Mechanical and Mechatronics

## Experiential Learning Activities

- Assess safety and risk
- Make and analyze coffee
- Analyze how the machines work
- Disassemble the coffee maker
- Communicate with classmates
- Reflect on engineering design



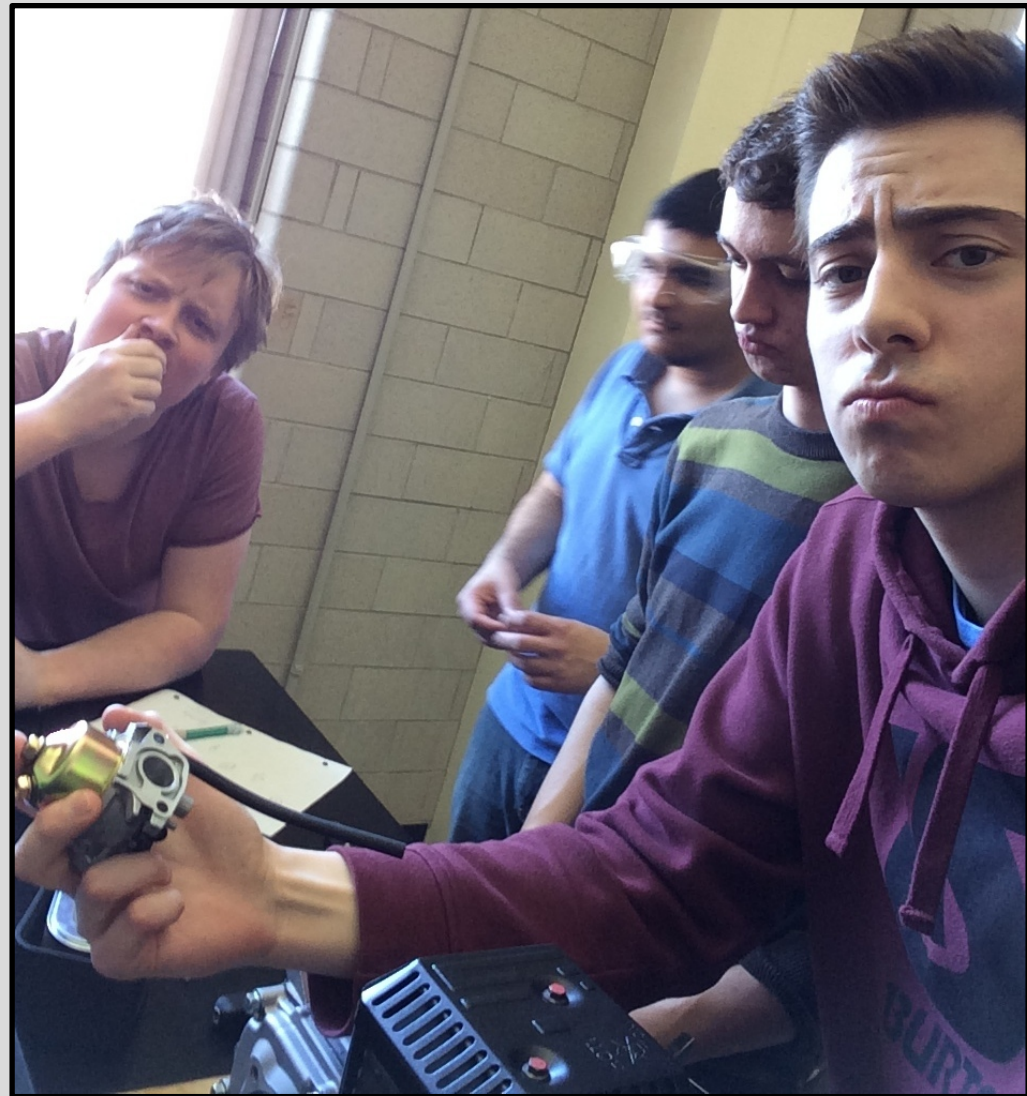
# Hardware Café

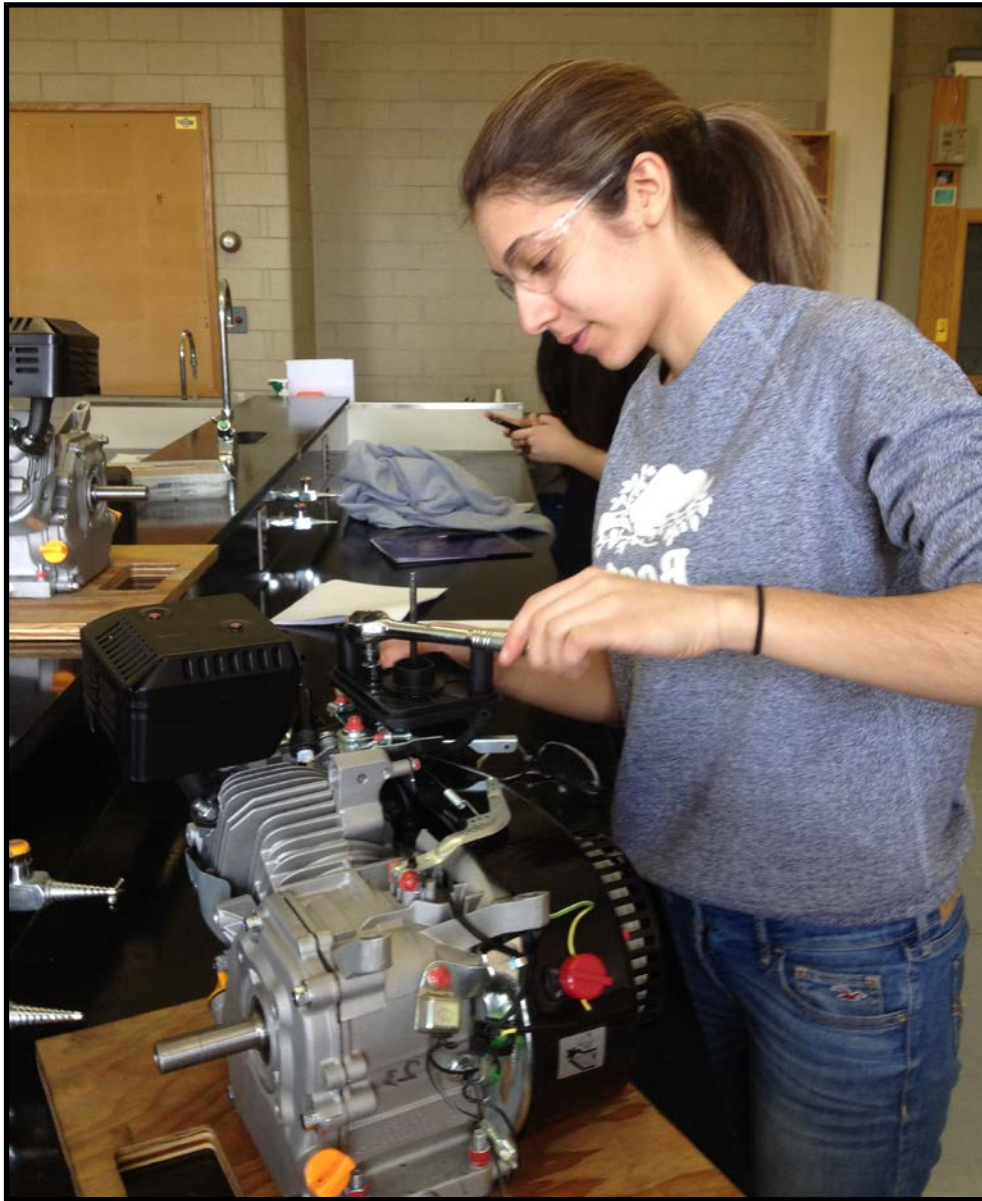
## Exploration Activities

- Traxxas car dissection: 330
- Repair cafe: 215 × 2
- Engine dissection: 320
- Carburetor: 105 × 3
- FC car measurement: 115 × 4
- Total: 3710 student hours of contact since October 17

## Maker Activities

- 400 hours since January 15
- Laser cut / 3D print / mill
- Self-serve



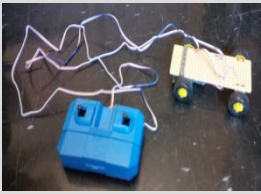


# Hardware Café

## Features of “clinic” activities

- Small numbers at one time (15)
  - + 1 TA, clinic staff, coop
- General-purpose equipment
- Open-ended tasks
- Quality student-staff-TA interaction
- Flexible hours





# Assembling a Remote-Control Car

~80 **Management Engineering** Students (1A Term)

## Task: Assemble & Test

- Read and understand assembly instructions
- Plan assembly steps and divide work
- Test on custom track

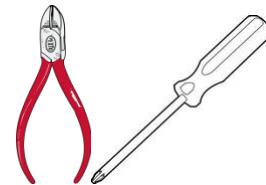


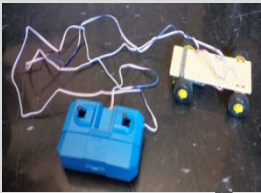
## ILOs:

- Understand challenges of large-scale manufacturing



- Work collaboratively in a team
- Work hands-on using common tools



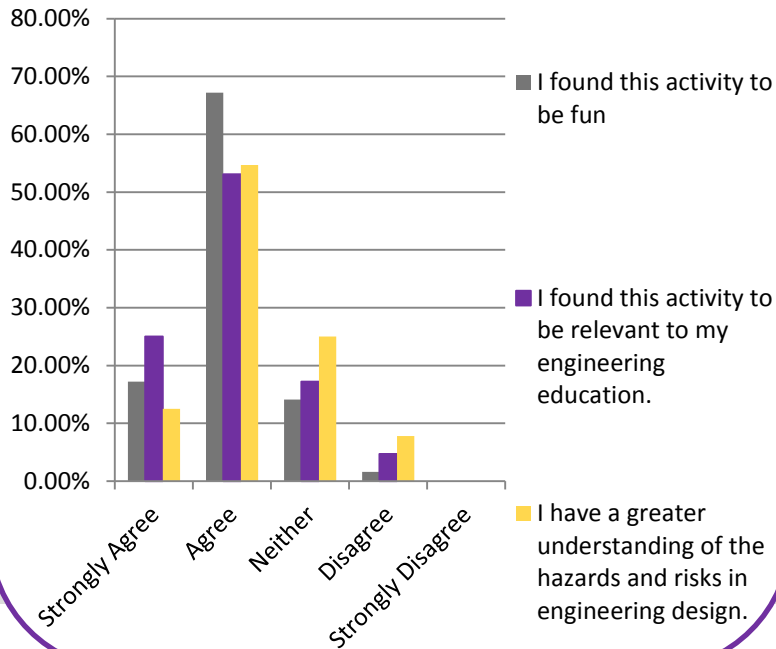


# Assembling a Remote-Control Car

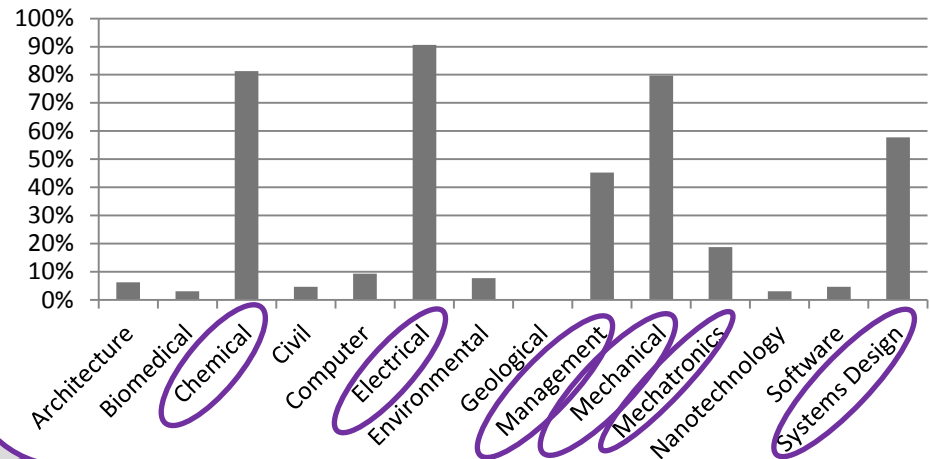
~80 Management Engineering Students (1A Term)

Post-activity survey

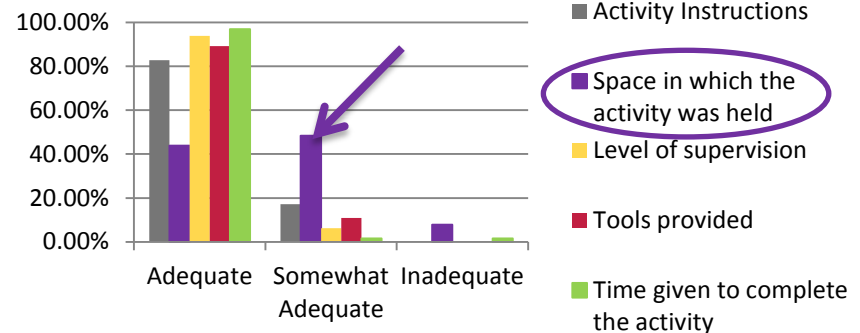
1. Indicate your level of agreement with the following:



2. Identify all the engineering disciplines that played a role in this engineering activity



3. Rate the quality of the following items:





# Electric Motor

- Wind electromagnets
- Assemble a brushless DC motor
- Manual testing
- Automated testing



Mechanical, Electrical and Computer Engineering students in different terms, expanding to Mechatronics in Spring 2015

Collaboration,  
Ill-Defined Problem,  
Reflection,  
Polished Product



# Electric Motor

F14/W15

S15 and beyond...

Electromagnetism

Assemble a motor

Reflect on your experience

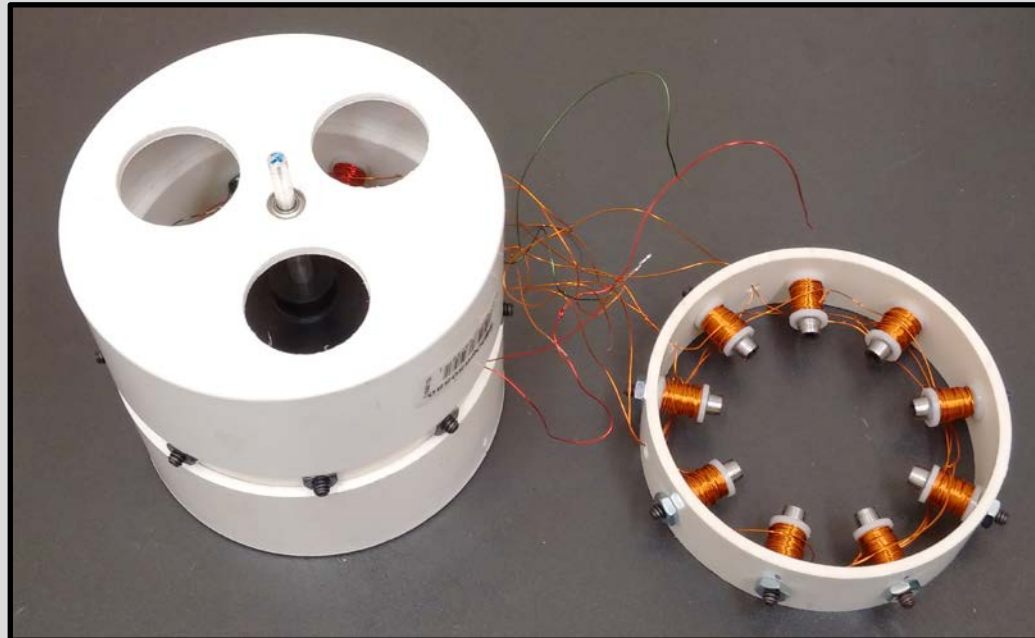
Model the motor

Design your motor

Build it

Test it

Reflect on your experience



# What Makes an Ideas Clinic Experience Different from a Lab, Workshop, or Project?

- Provide a breadth of activities and learning experiences
- Use open-ended design problems
- Use design problems that span multiple disciplines
- Coach and mentor students actively
- Provide a safe environment where students may fail without repercussions



# How Do You Create an Ideas Clinic Experience?

- Identify expected learning outcomes
- Suggest potential activities that exercise desired skills
- Seek out help from colleagues
- Anticipate and prepare for challenges
- Allocate extra time for experimentation and reflection
- Be persistent



# How Can Sustainable Activities Be Achieved?

- Update activities regularly
- Find motivated faculty and staff mentors
- Design activities into the curriculum
- Eliminate activities that do not achieve learning outcomes
- Spend less time assessing and more time mentoring



# How Do You Measure the Effectiveness of an Ideas Clinic Experience?

- Survey students before and after activities
- Observe students during activities
- Examine trends in the performance of students
- Ask for feedback from co-op employers



# Insights

- Please take a few minutes to reflect and comment upon this panel discussion...
  - » Have you gained any valuable insights during this session?
  - » How might you apply Ideas Clinic Experiences in your courses?
  - » If you would like to participate in an activity in the Fall, contact a member of the Ideas Clinic Team

***Thank You for Participating!***

