CENTRE FOR
Teaching and Learning

Transformation of Geological Sciences and Geological Engineering Field Methods to remote delivery using hands-on and virtual tools in fall 2020

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CTL Virtual Showcase of Teaching & Learning
May 5, 2021

Depth Beyond Knowledge™

Introduction: GEOE/L 221

Calendar Description

"The (engineering) field study of surficial deposits, rock types, and geological processes, based on the geology of the Kingston area. Descriptions, samples and measurements acquired on several field trips will be analyzed, and the results recorded in maps, sections, and reports throughout the course."

In Person Course Highlights

- Weekly field trips (8 weeks)
- Indoor labs (4 weeks)
- Class demonstrations
- Practical exercises
- Guest lectures
- Group term project

Course Learning Outcomes (CLOs)

CLO	DESCRIPTION	GEOE INDICATOR
CLO-1	**Demonstrate** that they can **plan** and **conduct** field investigations in a safe, ethical, socially, and environmentally responsible manner with scientific and academic integrity.	IN-1, PR-1, PR-2, EE-1, TW-1, IN-6
CLO-2	**Demonstrate** facility with basic field and lab techniques for reliable and meaningful **measuring and characterizing** of key geological and geological engineering parameters.	IN-1, KB-CEM-2, KB-TEP-3, IN-2, IN-6, PR-1, PR-2
CLO-3	**Categorize** and **compare** the rocks in an area and be able to **explain** the variability of the characteristics of components in a natural system.	IN-3, KB-CEM-2, KB-TEP-3
CLO-4	**Demonstrate** proficiency with basic principles of historical geology which they will be able to use to **logically determine** the sequence of geological events in an area.	KB-EOH-4, IN-3
CLO-5	**Apply** knowledge to **solve** geological and geological engineering problems with an incomplete or sparse data set in three dimensions.	IN-3, IN-4, IN-2, IN-1, KB-CEM-2, KB-TEP-3, KB-EOH-4

Course Learning Outcomes (CLOs)

CLO	DESCRIPTION	GEOE INDICATOR
CLO-6	**Begin demonstrating** spatial and temporal reasoning on all scales in real time during field work and during analysis of field data.	KB-EOH-4, IN-3, IN-4
CLO-7	**Select, analyze, synthesize, discuss** (oral), and professionally **report** (written, visual) on geological data as presented on maps and cross-sections.	IN-3, IN-4, CO-1, CO-3, ET-1, PA-1
CLO-8	In groups and individually, **critically evaluate** geological data and related information from a variety of sources on specific topics in field geology, and **report** the results in a variety of formats.	IN-3, IN-4, CO-1, CO-3, CO-4, TW-1, LL-2, KB-CEM-2, KB-TEP-3, KB-EOH-4
CLO-9	**Collect** and **interpret** data obtained while on the field trips, and **design** and submit a written **report** with maps and recommendations on a site-specific engineering problem.	IN-3, IN-4, IN-2, IN-1, DE-1, ET-1, EE-1, EC-1, IM-2, TW-1, CO-1, CO-2, PA-3

Course Evaluation

Assessment Tool	Time	Weight
Professionalism, Individual	Ongoing	5%
Q&A Engagement	Ongoing	5%
Lab Assignments		**30% (Subtotal)**
Lab 1, Individual	Week 1	5%
Lab 2, Individual	Week 2	5%
Lab 3, Individual	Week 3	5%
Lab 4, Individual	Week 4	5%
Lab 5, Individual	Week 5	10%
Group Project		**30% (Subtotal)**
Executive Summary, Group	Week 4	5%
Table of Contents, Group	Week 5	5%
Report, Individual Mark	Week 6	10%
Report, Group Mark	Week 6	10%
Exams (6 Quizzes & Final Oral)		**30% (Subtotal)**
Total		**100%**

Fall A 2020 Remote Delivery

Course "Storyboard"

Pyramid Style

ACQUISITION

DISCUSSION

PRACTICE

COLLABORATION

PRODUCTION

★ **Major Assessments**

WEEK 6: Tues. Oct. 13 – Tues. Oct. 20

ACQUISITION
L1: Guest – Don Lougheed
L2: Guest – Rob Harrap
L3: Guest – Chris Spencer

COLLABORATION
G1: Kingston area desktop site investigation

DISCUSSION
T1: Tutorial (Zoom)
D1: Week 6 Exit Ticket

PRODUCTION
Q1: OnQ Quiz

WEEK 7: Classes Oct 19-20; Exam Oct 22-24

ACQUISITION
L1: Guest – Rob Harrap
L2: Guest – Rob Harrap

COLLABORATION
G1: Self & Peer Assessment

DISCUSSION
D1: Exam Review & Course Wrap Up

PRODUCTION
G1: Submit Final Report & Map
Q1: Oral Exam ★

WEEK 4: Mon. Sept. 28 – Fri. Oct. 2

ACQUISITION
L1: Guest – Gisele Rudderham
L2: Guest – Tim Packulak
L3: Stereonets
L4: Boreholes & Drill Core
L5: Engineering Geology

V1: Stereonet Demo
F1: Field trip videos 1-3

PRACTICE
P1: Topography
P2: Complete Map & Section
P3: What's wrong with map?
P4: Stereonets

COLLABORATION
G1: Kingston area desktop site investigation (Submit ToC)

DISCUSSION
T1: Tutorial (Zoom)
D1: Week 4 Exit Ticket

PRODUCTION
A1: Topography & Stereonets
Q1: OnQ Quiz

WEEK 5: Mon. Oct. 5 – Fri. Oct. 9

ACQUISITION
L1: Guest – Mark Diederichs
L2: Guest – Callum Walter
L3: Guest – Madison Kennedy
L4: Surficial Geology & Soil Augering
L5: Economic Geology

F1: Field trip videos 4 & 5

COLLABORATION
G1: Kingston area desktop site investigation (Submit Exec. Summ.)

DISCUSSION
T1: Tutorial (Zoom)
D1: Week 5 Exit Ticket

PRODUCTION
MA1: Lighthouse Bay Virtual Geology Mapping (Ind.)
Q1: OnQ Quiz ★

WEEK 1: Tues. Sept. 8 – Fri Sept. 11

ACQUISITION
L1: Intro & Overview
L2: Earth Processes
L3: Age Relationships
L4: Igneous
L5: Sedimentary Pt. 1
L6: Sedimentary Pt. 2

R1: Deep Time
R2: Igneous Rocks
R3: Sedimentary Rocks

DISCUSSION
D1: Introductions
T1: Tutorial (Zoom)
D2: Week 1 Exit Ticket

PRACTICE
P1: Age relationships
Q1: Practice OnQ Quiz

PRODUCTION
A1: Age Relationships
Q1: OnQ Quiz

WEEK 2: Mon. Sept. 13 – Fri. Sept. 18

ACQUISITION
L1: Metamorphic Pt 1
L2: Metamorphic Pt 2
L3: Structure Pt 1
L4: Structure Pt 2
L5: Map Making Basics
L6: Cross-sections
R1: Metamorphic Rocks
R2: Structures & Maps

PRACTICE
P1: Rock ID & Description
P2: Paper 3D Models

DISCUSSION
T1: Tutorial (Zoom) + Lab Demo (Steve Beyer)
D2: Week 2 Exit Ticket

PRODUCTION
A1: Virtual Rock ID & Description
A2: Virtual Outcrop Sketching
Q1: OnQ Quiz

WEEK 3: Mon. Sept. 21 – Fri. Sept. 25

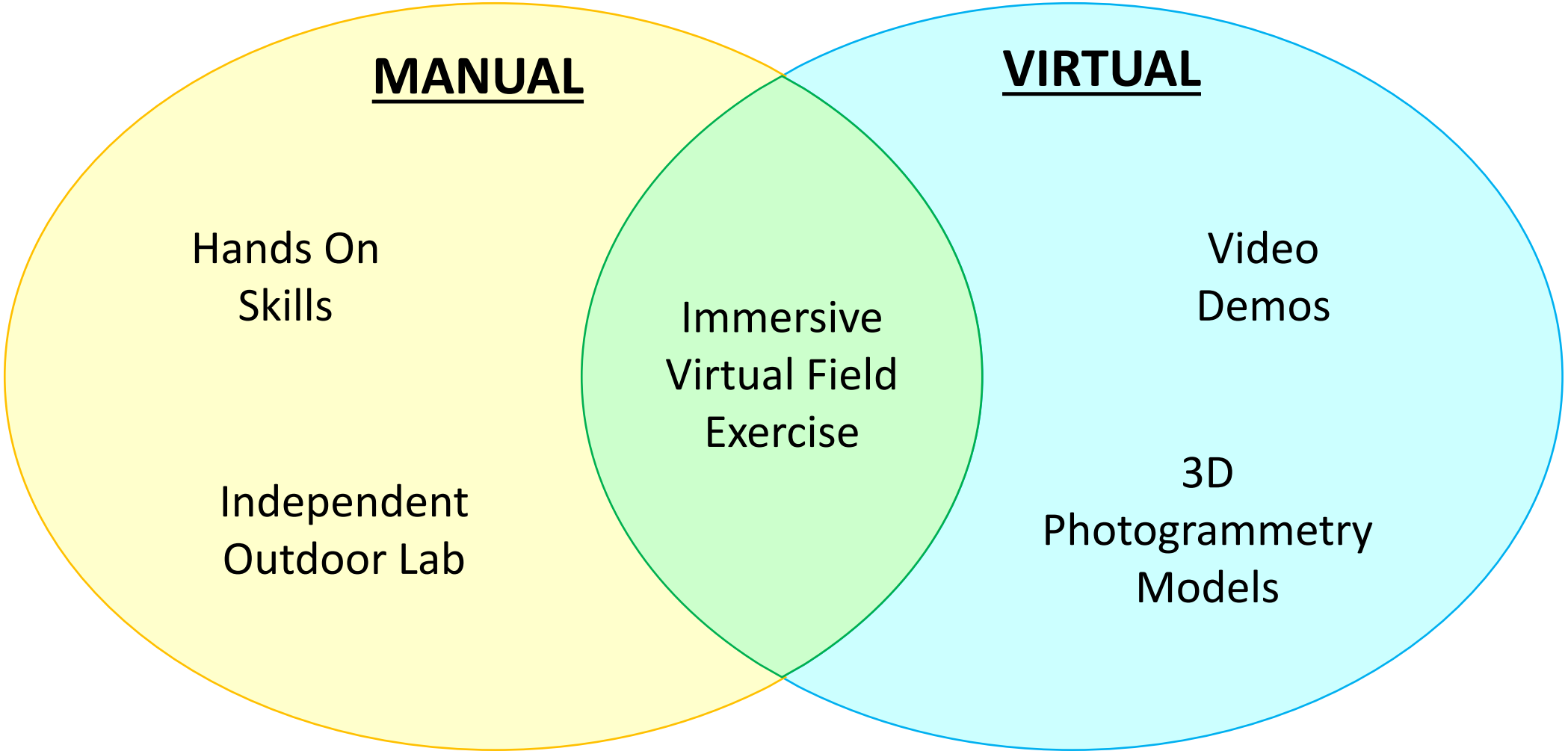
ACQUISITION
L1: Compass Measurements
L2: Field Safety
L3: Field Navigation
L4: Topography
V1: Map demo 1
V2: Map demo 2
V3: Orienteering
V4: Measurements
R1: Measurements

PRACTICE
P1: Complete the maps & cross-sections
P2: Virtual rock ID & description

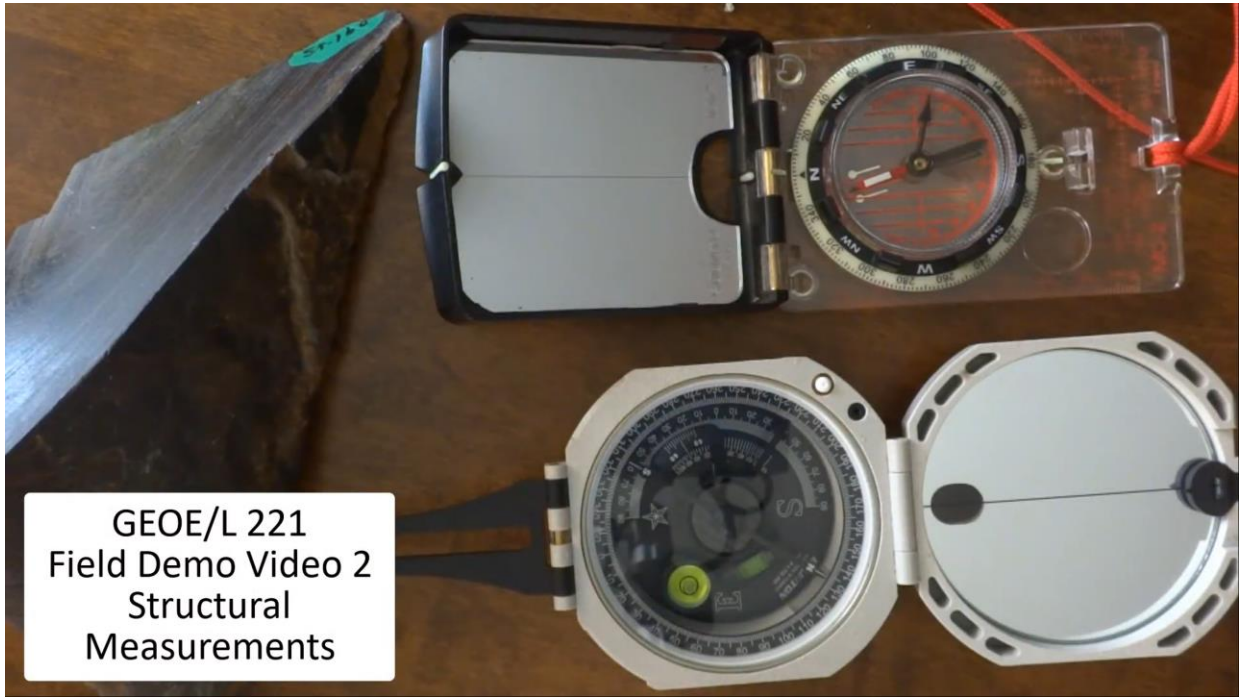
DISCUSSION
T1: Tutorial (Zoom)
D1: Week 3 Exit Ticket

PRODUCTION
A1: Complete Map & Section
A2: Virtual Rock ID & Description
A3: Orienteering & Measurement Principles
Q1: OnQ Quiz

Skills-Based Learning Elements

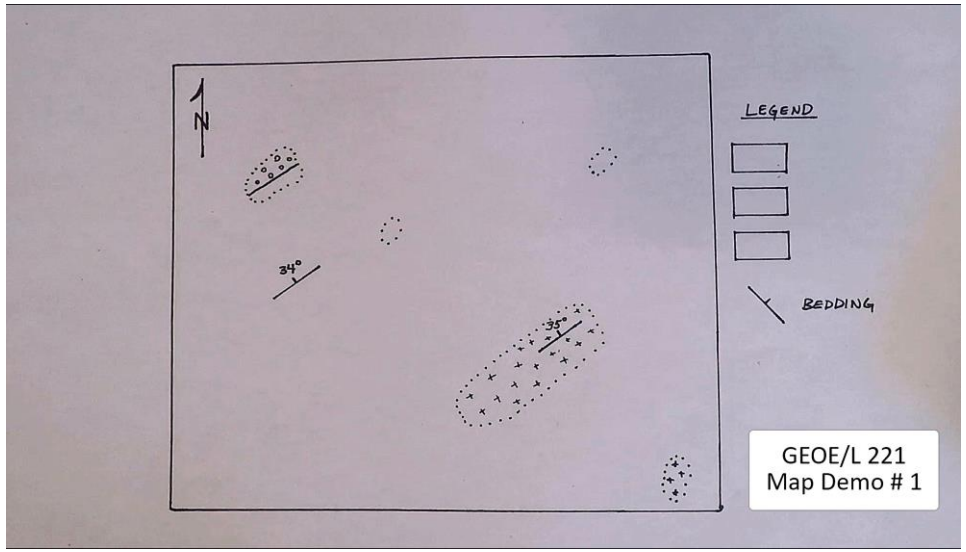


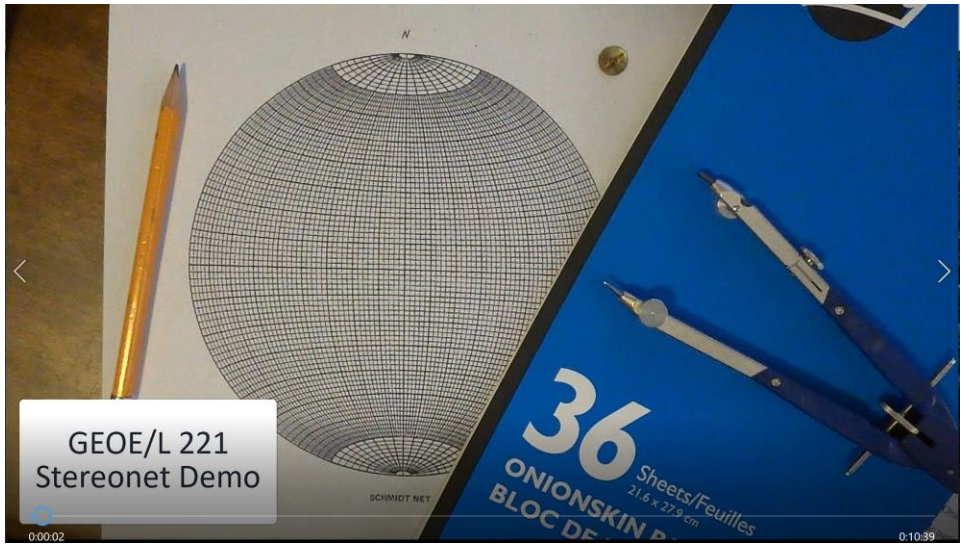
Field Skills Demo Videos

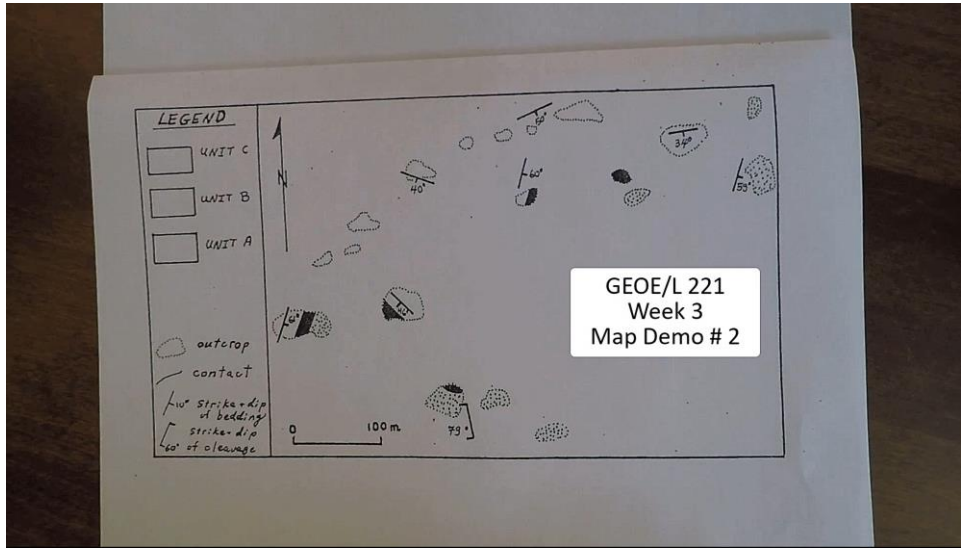


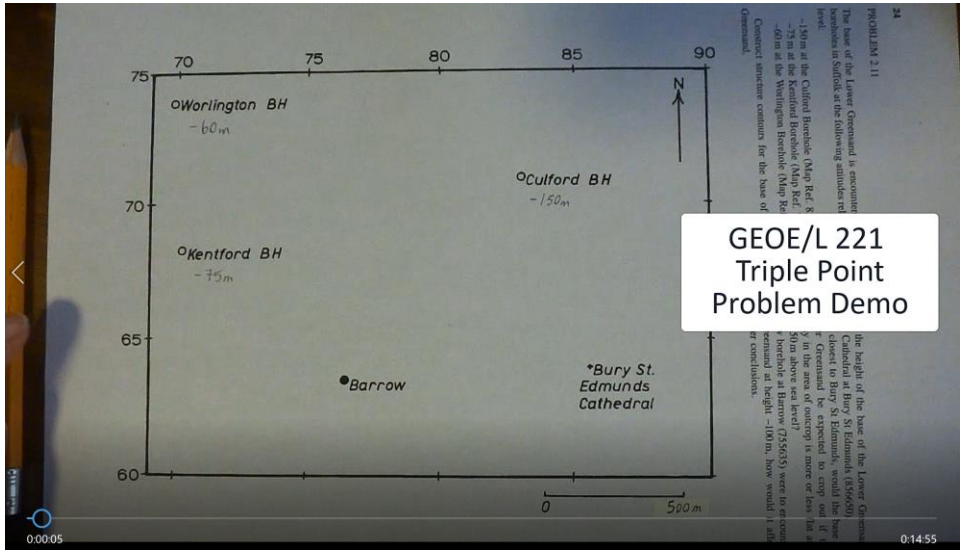
Field Trip Videos

Lab Skills Videos



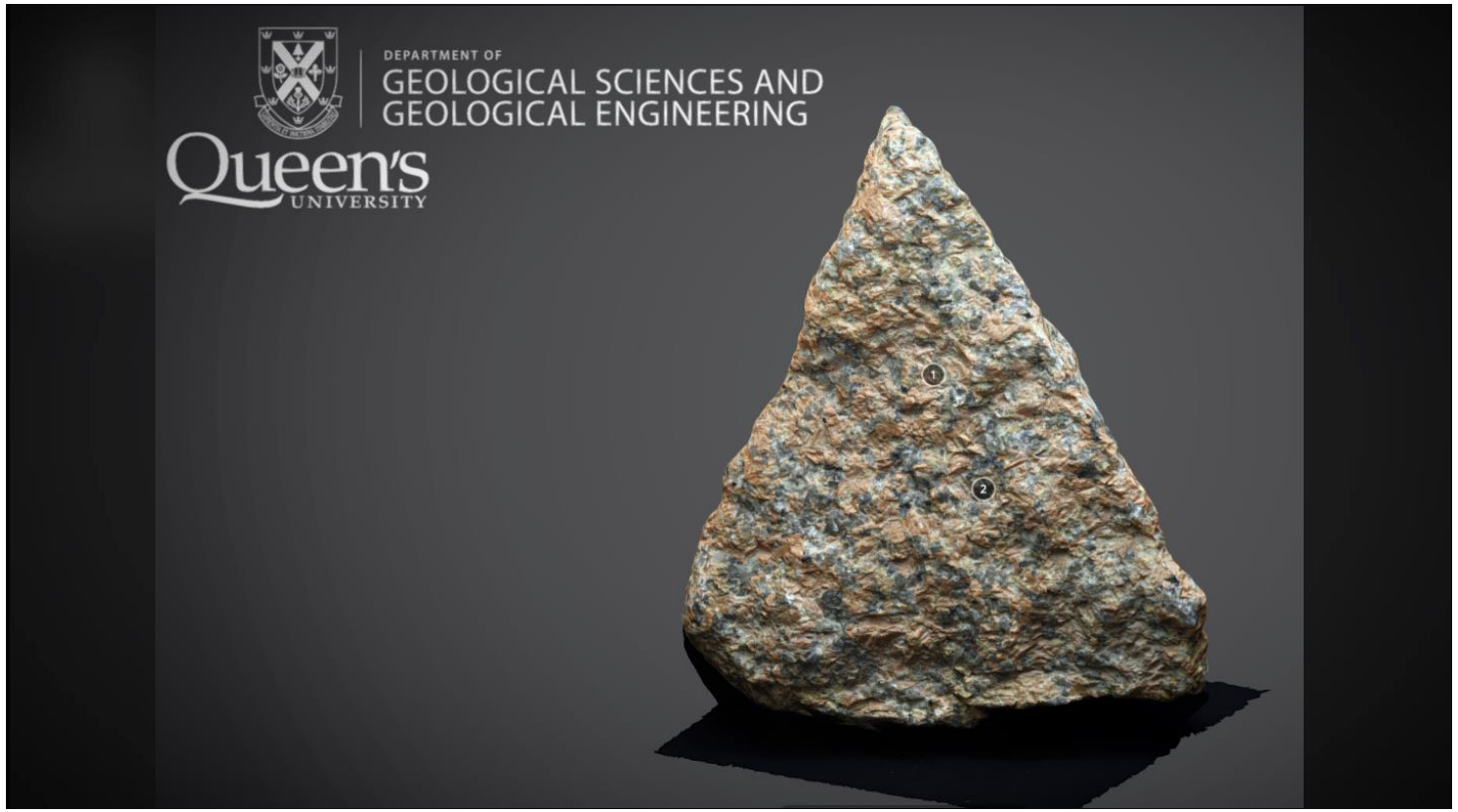


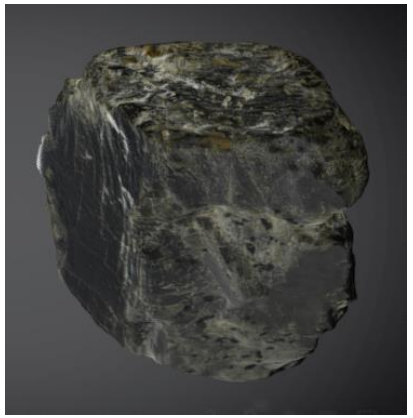




3D Models of Rock Hand Samples

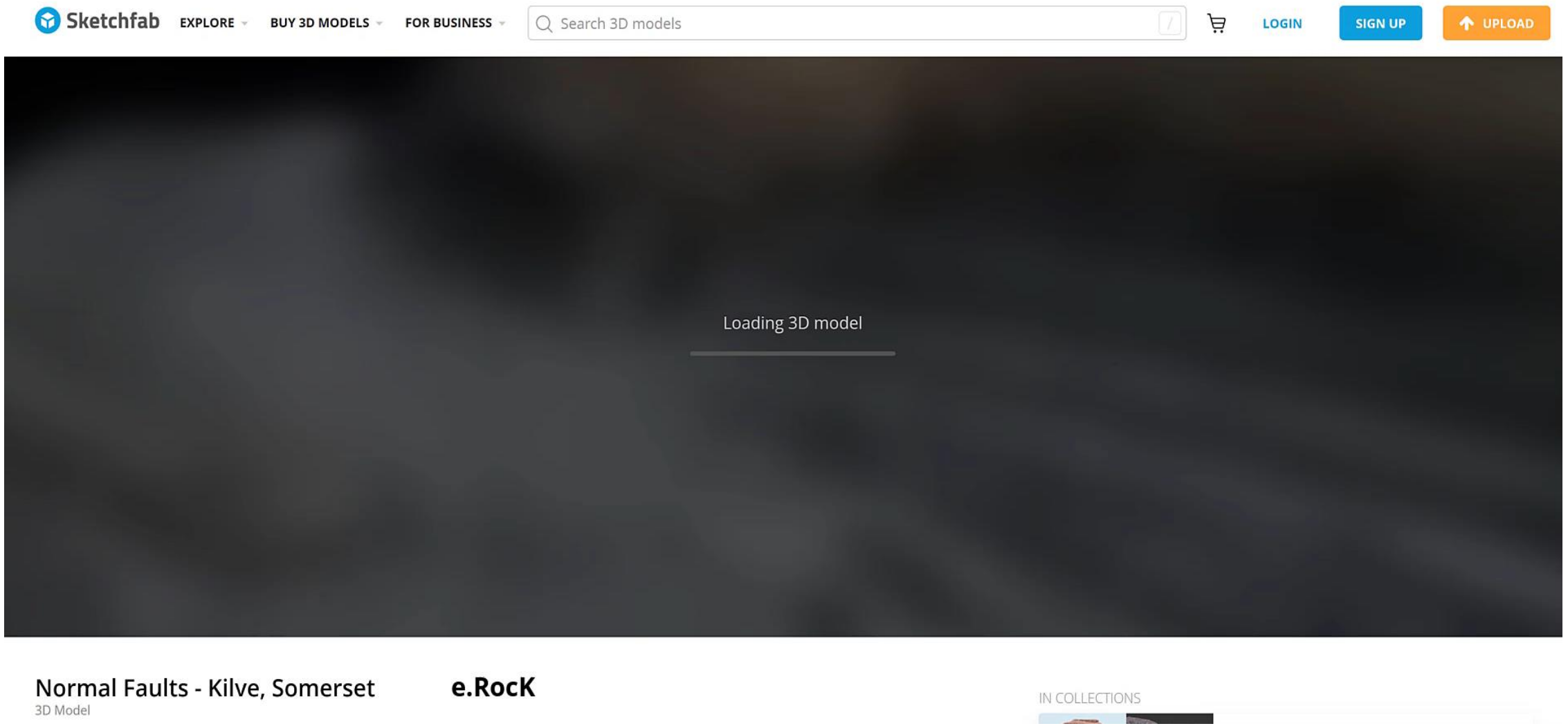
- 3D photogrammetry models on Sketchfab database from GSGE collection & public domain
- Virtualized skill development: rock observation & classification





3D Models of Outcrops

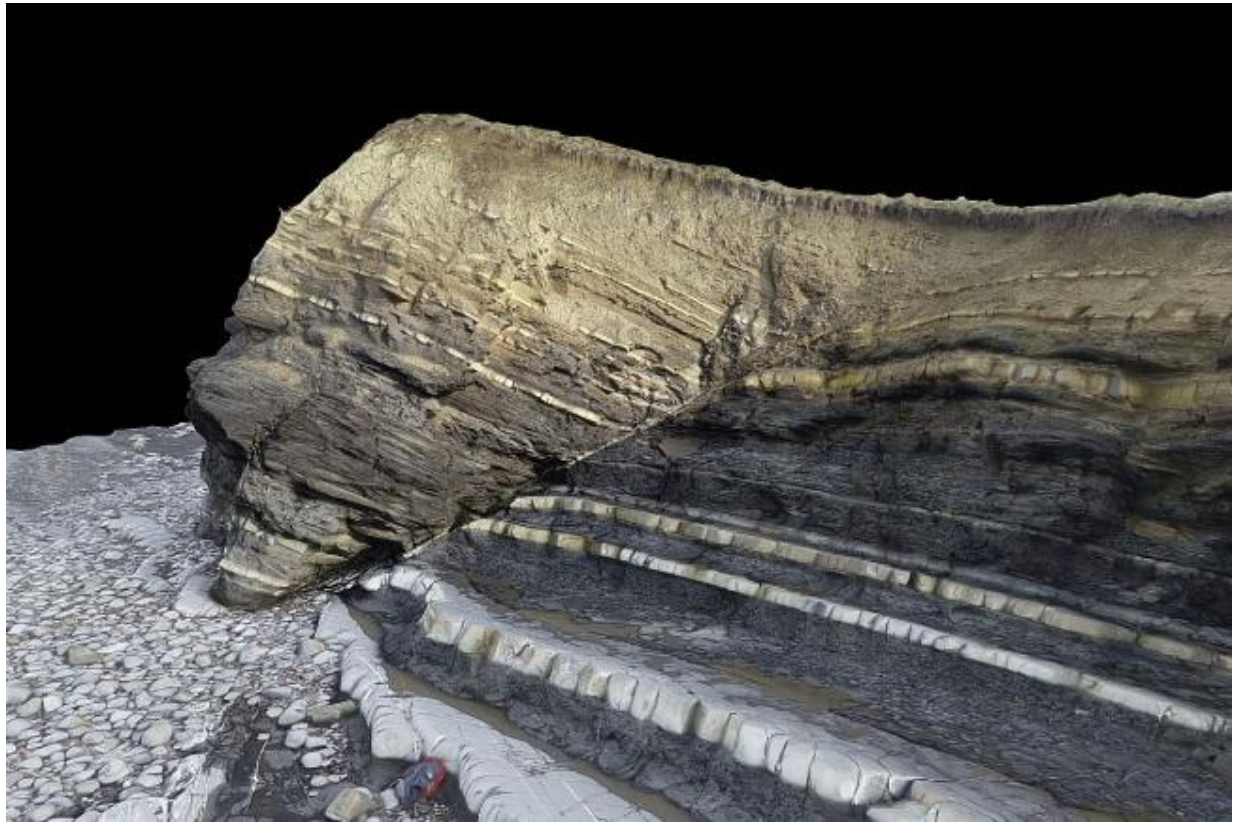
- Virtualized skills: rock observation & classification
- Manual skills: outcrop sketching



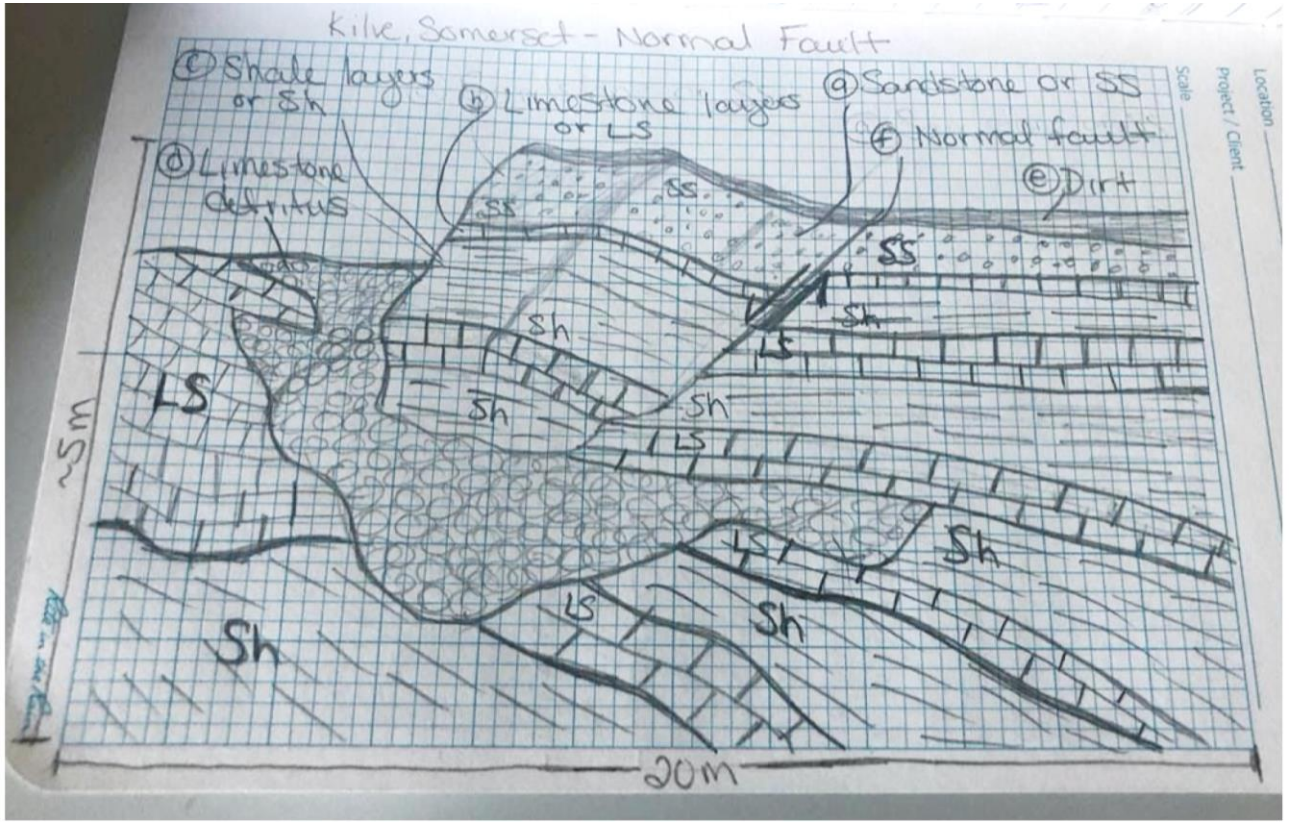
3D Models of Outcrops

- Virtualized skills: rock observation & classification
- Manual skills: outcrop sketching

Sketch Perspective

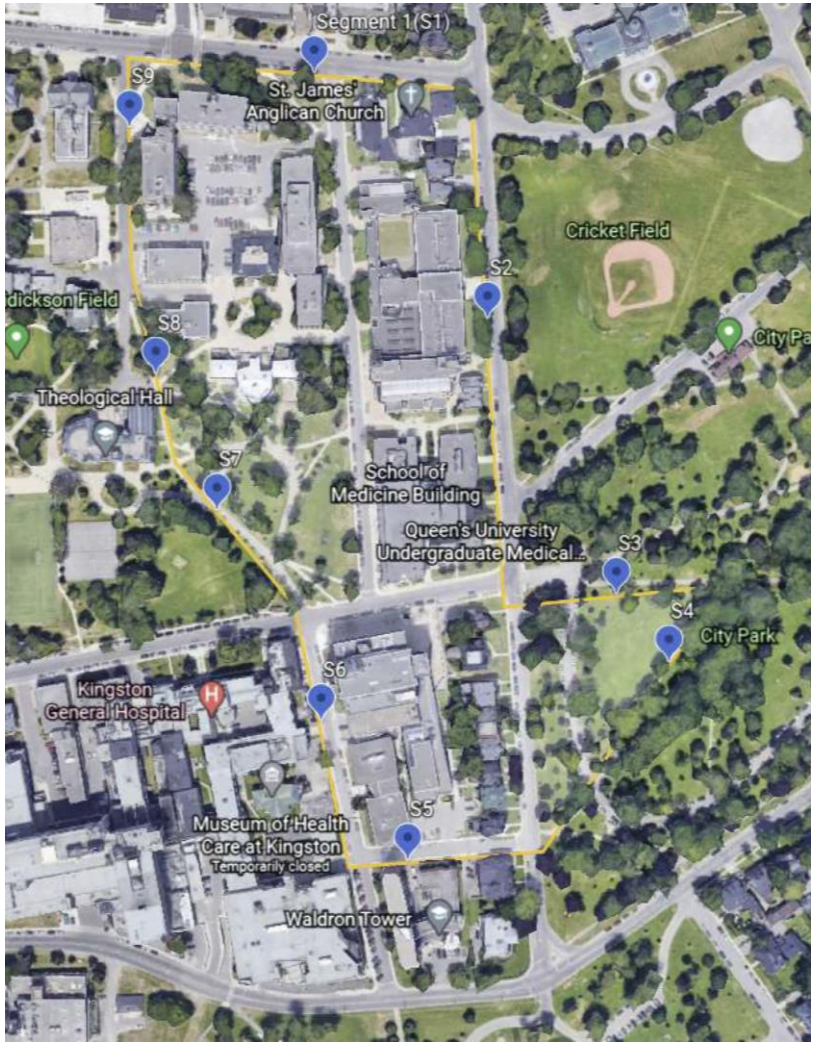


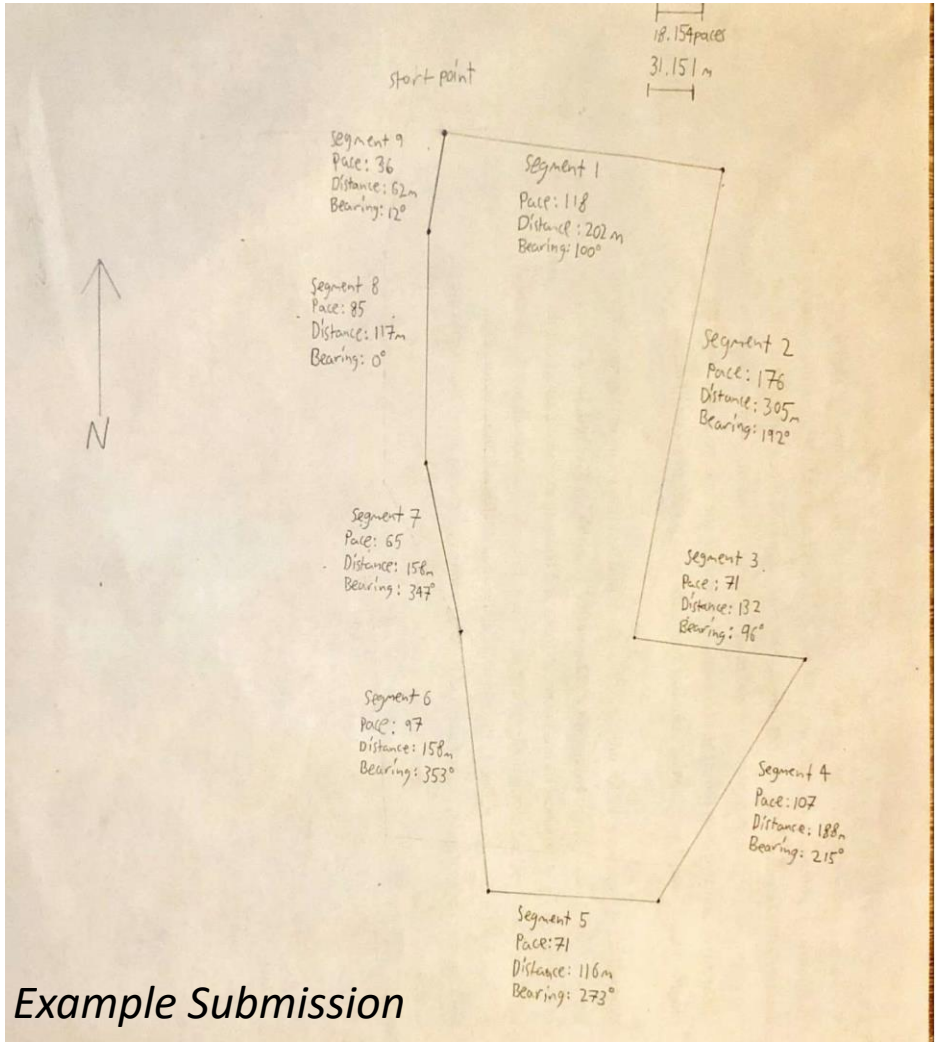
Example Sketch Submission



Independent Outdoor Lab: Closed Loop Traverse

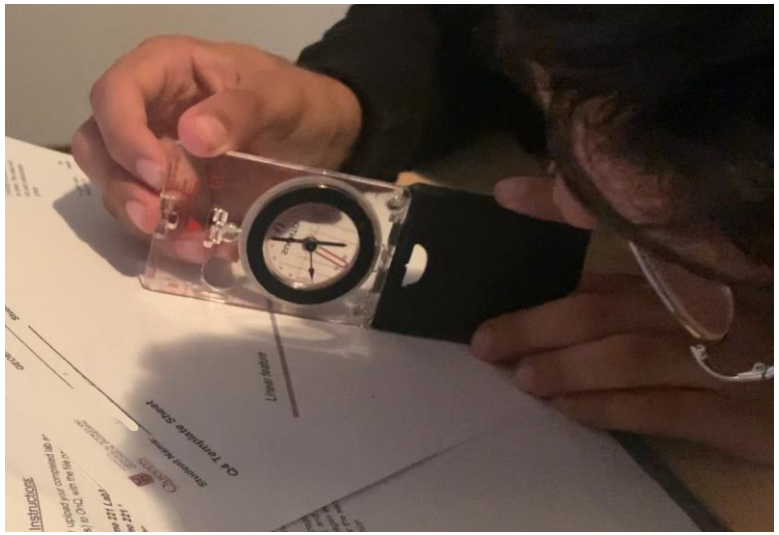
- Manual skills: orienteering, navigation

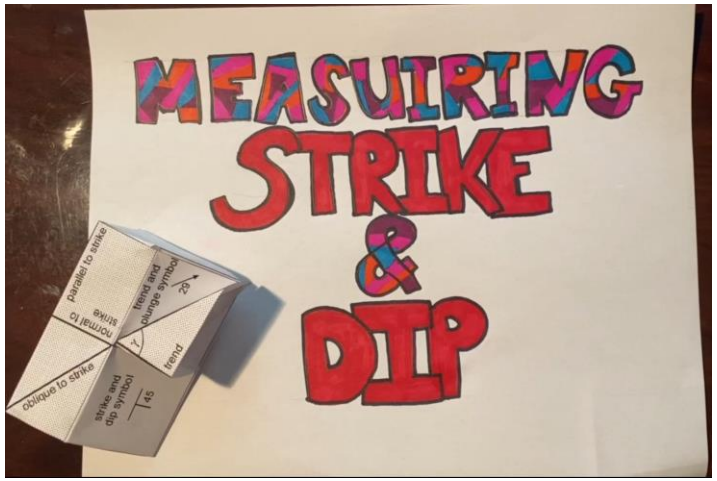


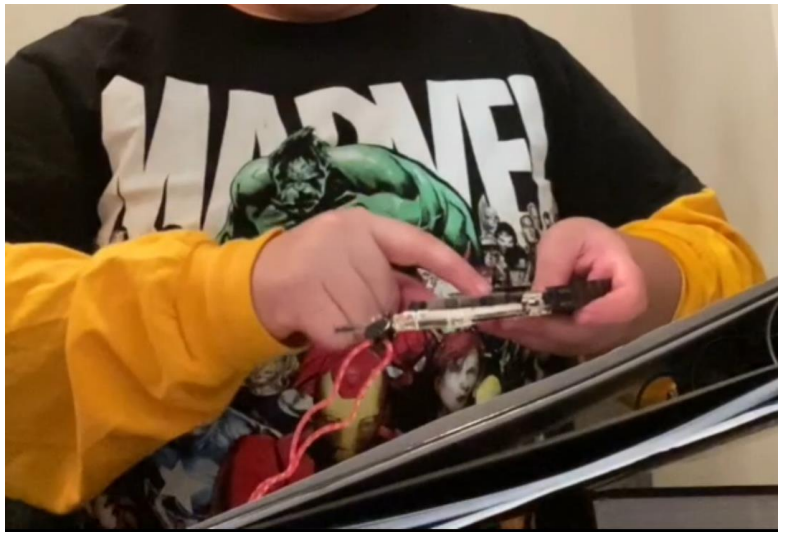


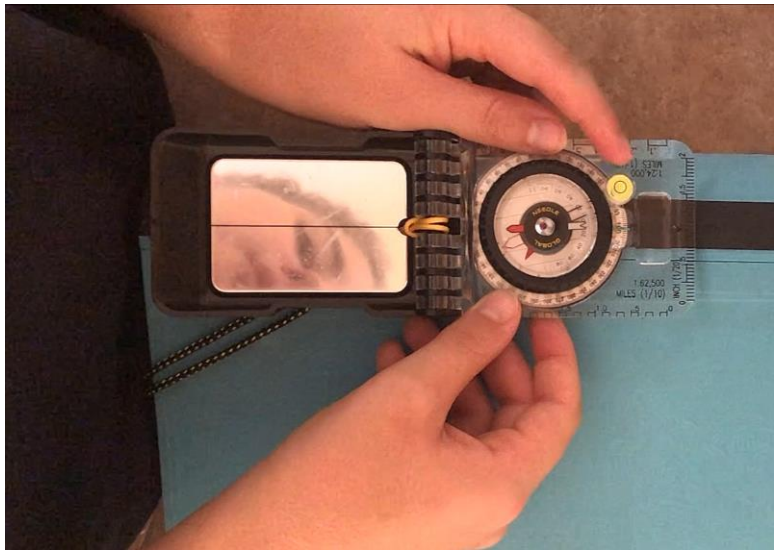
Example Submission

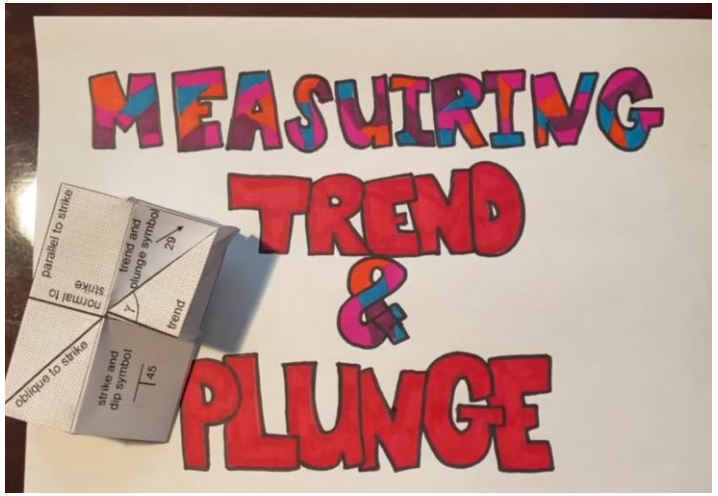
Manual Skills: Structural Measurements







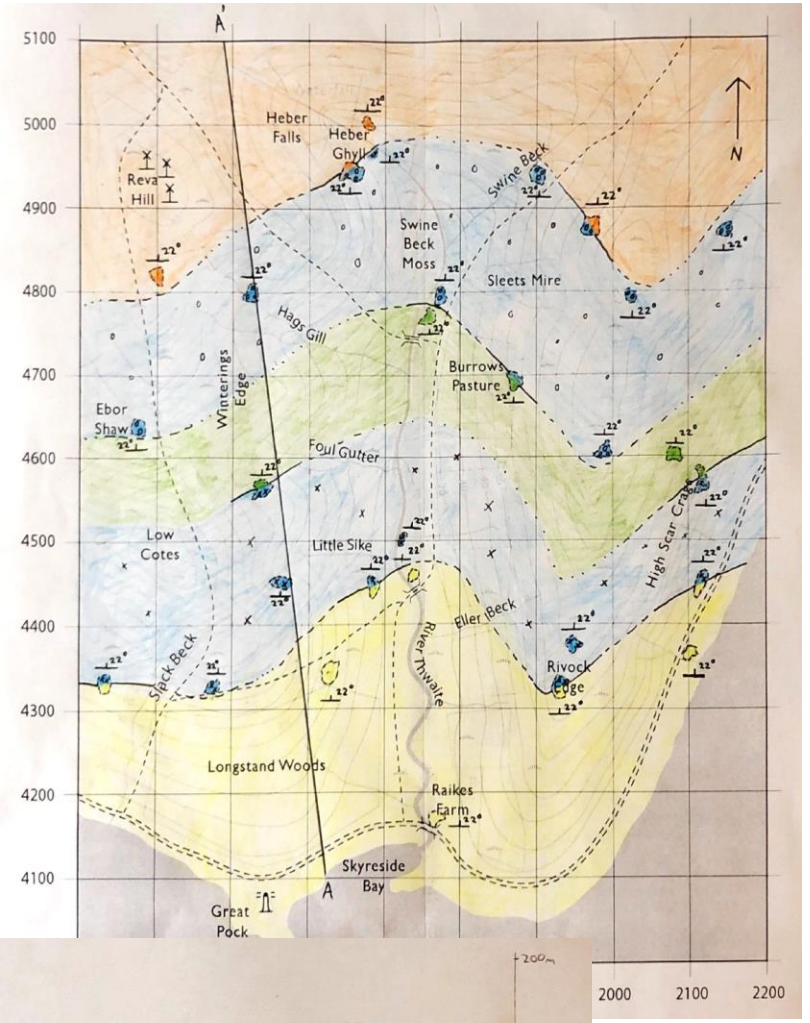


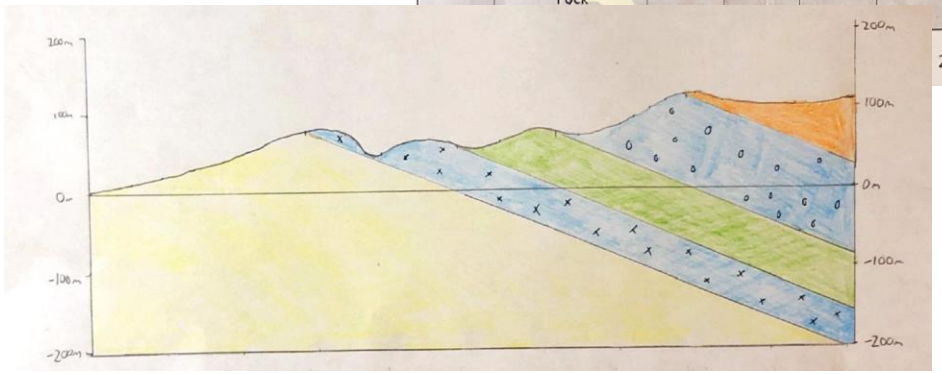


Immersive Virtual Field Exercise

- Virtualized skills: field navigation, traverse planning
- Manual skills: notetaking, drawing maps & cross-sections

http://www.see.leeds.ac.uk/virtual-landscapes/schools/index.html





Building Community

Introduce Yourself (Gallery Walk)

Reading Discussions (Perusall)

Lecture Discussions (Google Docs)

Synchronous Labs & Tutorials (Zoom, Breakout Rooms)

Group Project

Timeline: | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 |

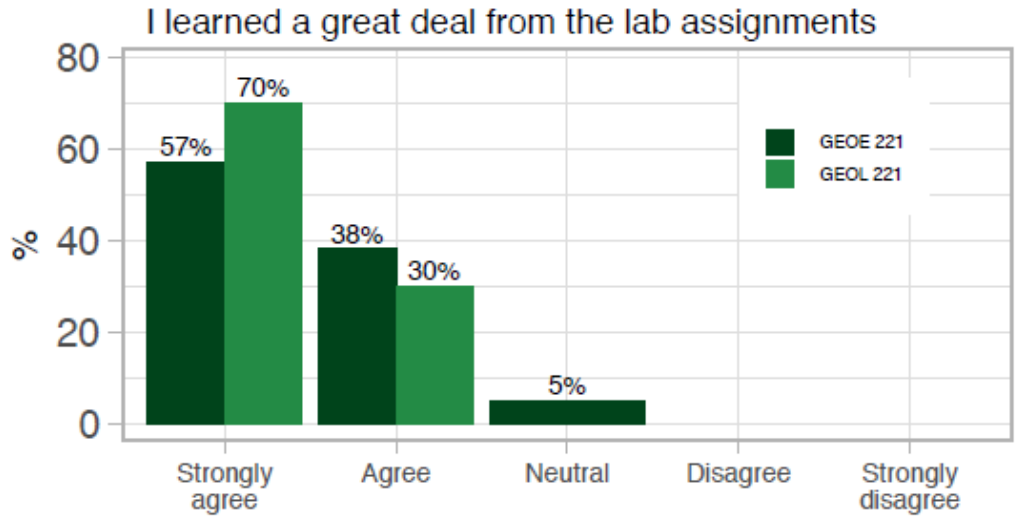
Dr. Jennifer Day, PEng, PGeo (Dr. Jenn Day)
(she/her)

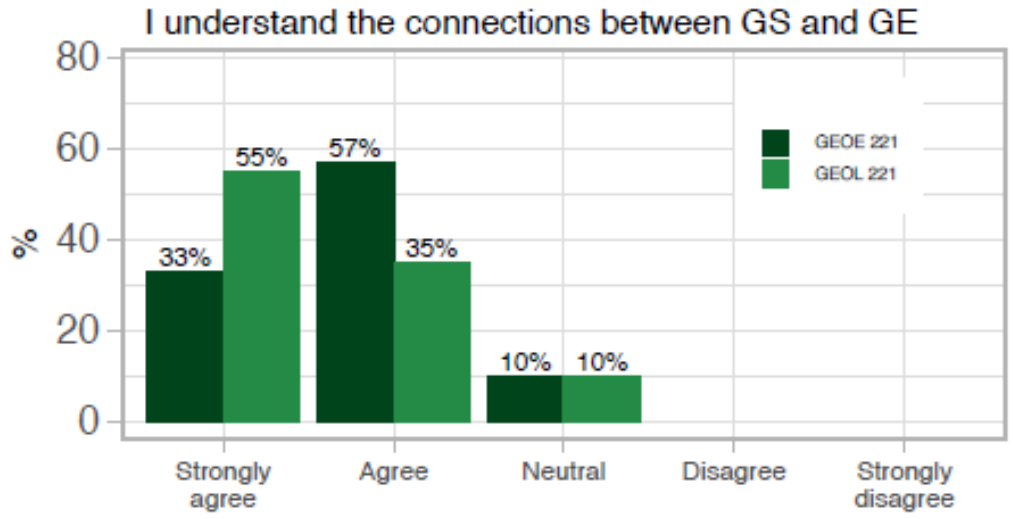
1. I grew up in Toronto, ON
2. I completed my undergrad at Queen's in Geological Engineering (SCI'11) and discovered Geological Engineering during APSC151 in first year.
3. I fell in love with the creativity involved with Geological Engineering and working with and in the natural world.
4. 5 years after completing my undergrad… I was finishing up my PhD and getting ready to move to Fredericton, NB for my first Assistant Professor position at the University of New Brunswick!
5. Most recently, I just welcomed a puppy into my home - an English Springer Spaniel named Gander (you may spot us in City Park near campus)! I also enjoy playing trumpet and like to cook and bake. My IG account is @rockdocdrday - feel free to follow me!

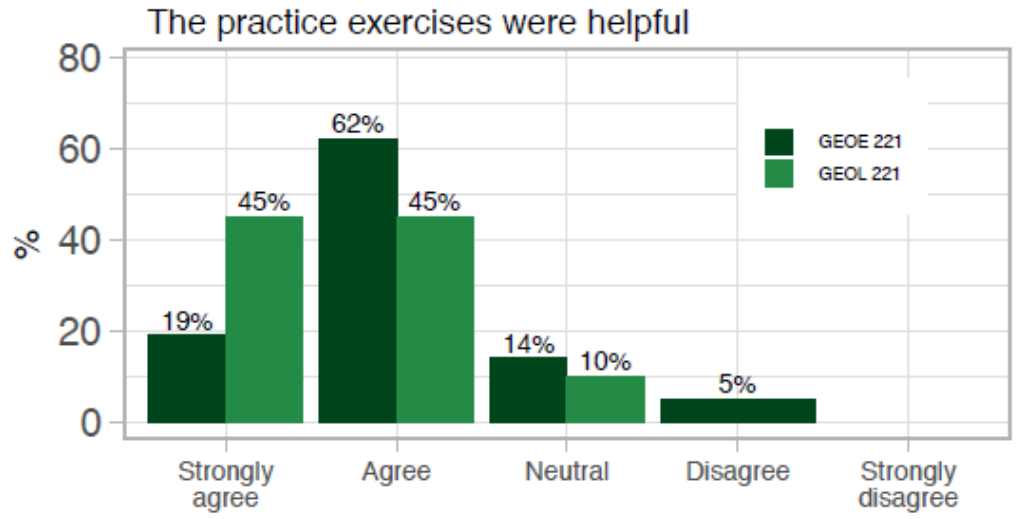
CLO Distribution

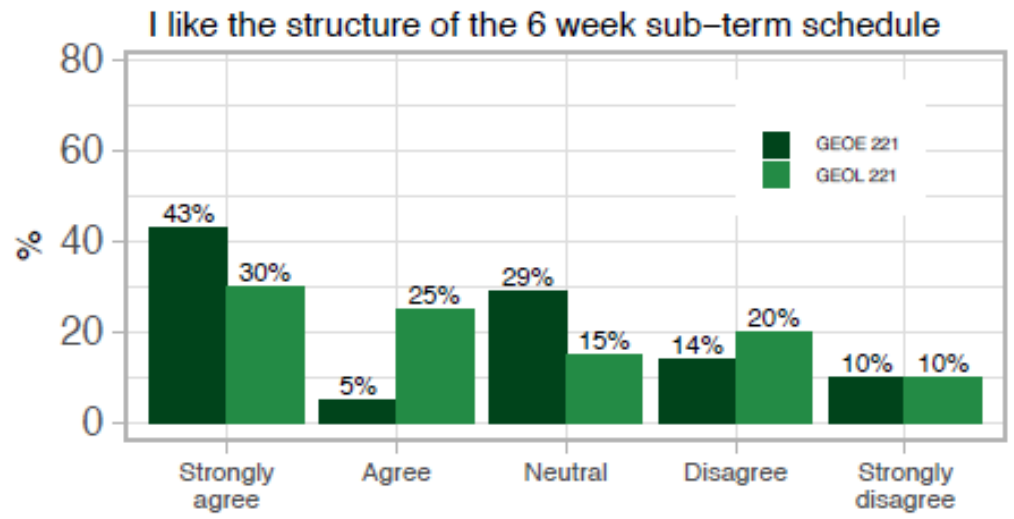
	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5	CLO-6	CLO-7	CLO-8	CLO-9
ONGOING									
Professionalism	X								
Q&A Engagement	X								
LAB ASSIGNMENTS									
Lab 1, Individual				X		X			
Lab 2, Individual		X	X	X					
Lab 3, Individual	X	X			X	X	X		
Lab 4, Individual					X	X			
Lab 5, Individual	X		X	X	X	X	X		
GROUP PROJECT									
Executive Summary							X	X	X
Table of Contents							X	X	X
Report							X	X	X
EXAMS									
Quiz 1, Individual		X	X	X		X			
Quiz 2, Individual		X	X	X					
Quiz 3, Individual	X	X	X	X					
Quiz 4, Individual		X	X		X	X			
Quiz 5, Individual		X	X			X			
Quiz 6, Individual	X		X	X		X			
Final Exam (Oral)			X	X		X	X		

Student Feedback









Conclusions

- All CLOs were achieved in remote fall 2020 offering!
- Overall student feedback was positive in the context of their first fully remote term during COVID-19
- Interactive & group work elements important for building class community
- Many resources & tools developed here will be implemented in person

Acknowledgments

- TA Gisele Rudderham, GSGE
- TA Adriana Taylor, GSGE

- Rob Harrap, GSGE
- Anne Sherman, GSGE
- Mark Diederichs, GSGE
- Dylan Layton-Matthews, GSGE
- Lauren Anstey, CTL
- Nerissa Mulligan, ETLT
- Eric Tremblay et al., ETLT
- National Association of Geoscience Teachers (NAGT)

Thank You
for your kind attention!

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Queen's Geomechanics & Geohazards Group

The Geo Engineering Centre
Depth Beyond Knowledge™