

# An Industry-Academic Collaboration to Develop a Geology Field Trip to Improve Students' Learning Experience

Walter Yerk<sup>1\*</sup>, Patricia Gallagher, Ph.D., P.E.<sup>1</sup>, Kristin Sample-Lord, Ph.D., P.E.<sup>3</sup>, Philip Getty, P.G.<sup>2</sup>, Loïc Vanderkluyzen, Ph.D.<sup>1</sup>, and Robert Swan, Jr.<sup>1</sup>  
<sup>1</sup> Drexel University, <sup>2</sup> Boucher & James Inc., <sup>3</sup> Villanova University; \*[wgy23@drexel.edu](mailto:wgy23@drexel.edu) | AGU Fall Meeting 2018, abstract ED43G-1294

## Background

- Geotechnical engineering faculty collaborated with geologists to develop a novel field trip for their engineering geology course
- Geologists included a practicing environmental hydrogeologist and an academic volcanologist for expertise in both soft and hard rock geology
- A small seed grant provided funding
- Focus:
  - Importance of rock type on engineering properties
  - Effects of plate tectonics and weathering on rocks
  - The interaction of humans with the lithosphere and hydrosphere

## Engineering Geology Course Overview

- **Goal:** To have students understand how geology influences civil, architectural and environmental (CAE) engineering
- **Content:** Introductory physical geology, rock mechanics, and geomorphology
- **Topics:**
  - Earth's structure and tectonic processes
  - The rock cycle, minerals, and major rock classes
  - Introductory rock mechanics
  - Introductory geomorphology
  - Geologic hazards
  - Engineering properties of geologic materials
  - Interaction of human activity with the lithosphere and hydrosphere

## The Setting: Wissahickon Valley Park, Philadelphia, PA

- Dynamic stream ecosystem within a geologically diverse setting (Fig. 1)
- Area has been highly impacted by urban development of Philadelphia

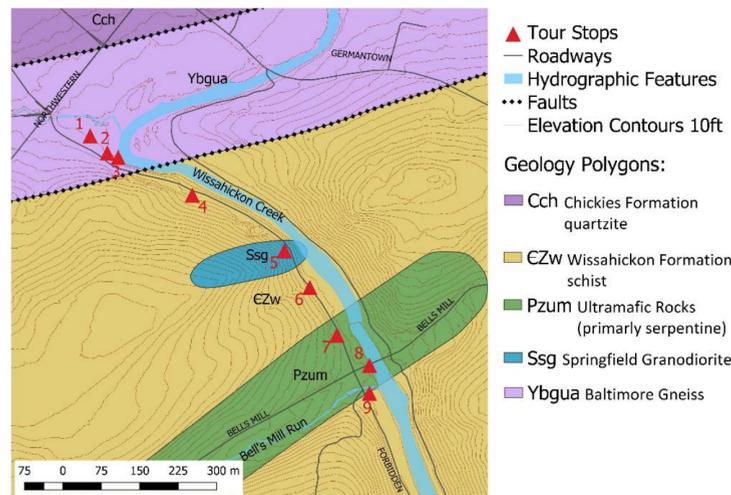


Figure 1. Trip route stops. Geology polygons modified from Bosbyshell (2006).

- Geologic and geomorphologic features (Fig. 2):
  - Interbedded schists and quartzites of the Wissahickon Formation
  - Baltimore gneiss, the basement rock of the North American craton
  - A granodiorite intrusion and a serpentinite ultra-mafic body
  - The Rosemont fault, an inactive fault in the region
  - Wissahickon Creek demonstrates sedimentary processes and acute erosion
- Engineering features:
  - Stone arch bridge over Bells Mill Road with visible deficiencies
  - A tributary to Wissahickon Creek undergoing stream stabilization and restoration because of erosion threat to Bells Mill Road
  - Former quarries
  - Examples of interactions between the natural and built environments

## Lessons Learned

- **Be bold!** Add geo-stories and geo-facts related to the formations and features
- Engineering facts about the geologic and geomorphologic features of the trip sparked interest and enthusiasm in the students
- Based on our own and students' feedback after the inaugural tour we made corrections:
  - Re-drafted a more concise *Student's Guide*
  - Added a very detailed *Self-Guide* for the students who missed the group trip

## Students' feedback

A 14-question survey exploring students' attitude toward the trip was administered through the Blackboard Learn course management system. Table 1 shows an example five questions and scores.

The amendments made to the Fall trip increased the average scores of 14 questions of the survey (Fig. 3). The "Strongly Agree" scores improved the most.



Figure 2. Selected trip stops: (a) Wissahickon Formation outcrop showing folding (highlighted in red); (b) Serpentinite in a former quarry.

Table 1. Excerpts from the voluntary, 6-point Likert scale surveys of the students' attitude toward the trip. The scores are for the sum of "strongly agree" and "agree" responses.

Question	Spring (n = 39)	Fall (n = 23)
<i>The field trip improved my...</i>		
... overall learning experience	87%	100%
... ability to apply basic geology knowledge in a real-world context	89%	100%
... understanding of the relevance of geology to engineering	82%	100%
... interest in how rock, soil, water, and climate play roles in engineering infrastructure.	72%	83%
The field trip should be offered again	100%	100%

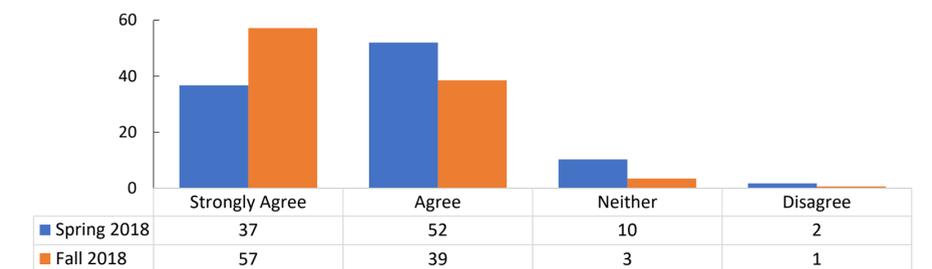


Figure 3. Change of the average of the scores of all 14 answers of the survey from the original (Spring) and amended (Fall) trips. The "Strongly Disagree" and "Not Applicable" scores were 0.

## References

Bosbyshell, H. (2006). "Bedrock geologic map of the Chester Valley and Piedmont portion of the Germantown, Malvern, Norristown, and Valley Forge quadrangles, Pennsylvania." Pennsylvania Geological Survey.

## Acknowledgements

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