Engaging an Entire STEM Division in Professional Development: Supporting Students Through the Whole Curriculum

Kaatje van der Hoeven Kraft (kkraft@whatcom.ctc.edu), Whatcom Community College, Science Department & Ed Harri (eharri@whatcom.edu), Whatcom Community College, Office of Instruction; Bellingham, WA

Introduction & Overview

Students transferring from two-year colleges (2YC) to four-year colleges/universities (4YC/U) are more successful when the transfer process is clear for the student, classes are well articulated between institutions, students are well prepared academically for the content at the transfer institution, and students feel valued and respected at their new institution (for a general overview, see Malcom & Feder, 2016). These factors are important for geoscience students and are even more acute as they navigate multiple sciences, math courses and field camp in addition to their primary major field courses (Wolfe, van der Hoeven Kraft, & Wilson, 2015).

If these issues are not addressed, students are less likely to successfully navigate the transfer process, which impacts goals of increasing diversity in the geosciences (and STEM at large) for issues of equity (Holdren & Lander, 2012).

"Change at the Core (C-Core)" is an NSF-funded institutional transformation project involving 90+ STEM faculty across 3 interlinked institutions (Western Washington University (WWU), Skagit Valley College (SVC) and Whatcom Community College(WCC)) focusing on increasing diversity in STEM through student-centered learning in geology, biology, chemistry, physics, math, engineering, and computer science through a professional development model.

NAGT Traveling Workshop Program

The NAGT Traveling Workshop Program (TWP) brings facilitators who are trained in facilitating course and/or department reform to a department/program to provide needed time for reforming curriculum and instruction (https://nagt.org/nagt/profdev/twp/index.html).

Benefits of working with TWP:

- Resources from SERC already provide a sound foundation
- Having one external (Karl Wirth) and one internal (Kaatje) facilitator lent authenticity while still knowing the community
- Karl's personal success stories at a four-year college helped convince some of the more skeptical faculty that there was enough rigor within the courses.

This research is supported by Award#: 1347711. All opinions are those of the authors and do not necessarily represent those of the National Science Foundation.

Figure 1. Pictures from the STEM Retreat a. Participants use ABCD cards as part of their workshop experience; b. WCC STEM faculty discuss big ideas with the dean of Science and Engineering from WWU; c. Math faculty spending time working on their class projects; d. Evening dinner with participants at sunset

Key Outcomes

- 30 STEM faculty attended the retreat. 13 attendees (43%) had not previously participated in C-Core, 11 participants (37%) were adjunct faculty.
- 22 teaching contributions available to the larger population spanning the STEM domains of Biology, Chemistry, Computer Information Systems, Computer Science, Engineering, Environmental Science, Geology, Math, Nutrition, & Physics (all activities: http://nagt.org/169259).
- Increase in conversations across the division (figure 2)
- Seven new Professional Learning Communities were established to continue the conversation after the retreat, bringing in new faculty to the conversation including:
  - Language translation across courses
  - How we use canvas
  - How we teach graphs
  - How we use calculators
  - How we use technology
  - Supporting teaching and learning
  - Using Reading Apprenticeship for STEM students
- Research presented at American Society for Engineering Education based on Knowledge surveys (Davishahl, 2017)

WCC STEM Retreat

In an effort to address some of these concerns and challenges in our own STEM division retreat. In September, 2016 we held a 2.5 day retreat off campus at the Semiahmoo Resort in Blaine, WA.

- 83% (19) of our full-time STEM faculty had participated in C-Core, only ~14% (4) of our adjunct faculty had.
- Adjunct faculty teach more than 50% of our classes.

During our retreat, we were able to:

- Address how to structure a course in a backwards design approach and reformed teaching practices strategies (figure 1a)
- Included cross-institutional conversations (figure 1b)
- Provide assessment and metacognitive strategies to implement into the curriculum
- Provide *time* to work on a course/activity within a course (figure 1c)
- Provide feedback to each other on the development of activities and coursework
- Discuss how to move forward as a division.
- Spend time having informal interactions and community building (figure 1d).

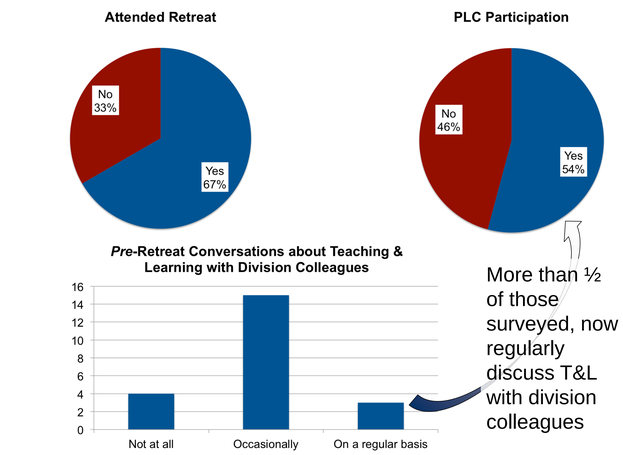

Figure 2. Survey administered to division in May 2017 indicates that even among non-participants, an increase in communication has occurred as a result of PLC's (n = 24)

References

- Davishahl, E. (2017). *Knowledge Surveys in Engineering Statics*. Presented at American Society for Engineering Education Annual Meeting. Columbus, OH, June 2017.
- Holdren, J. P., & Lander, E. (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics*. Washington, D.C.: Executive Office of the President.
- Malcom, S., & Feder, M. (Eds.). (2016). *Barriers and opportunities for 2-Year and 4-Year STEM degrees: Systemic change to support students' diverse pathways*. Washington, D.C.: National Academies Press.
- Wolfe, B., van der Hoeven Kraft, K., Wilson, C. (2015). Factors that contribute and inhibit successful transfer for two-year college students: Implications on strengthening the geoscience transfer process. Earth Educators Rendezvous Poster Session. goo.gl/H3vwgd