SAGE 2YC

Supporting and Advancing Geoscience Education in Two-year Colleges



Focusing on Teaching to Promote Student Success: Faculty Change Agent Roles in SAGE 2YC

Pamela L. Eddy, *William & Mary* (pemala.eddy@wm.edu)
Ellen Iverson, *Carleton College* (eiverson@carleton.edu)
Yi Hao, *William & Mary* (yhao01@email.wm.edu)
Debra Bragg, *Bragg Associates* (bragg.associates.inc@gmail.com)

Student learning is at the center of national discussions, especially as it relates to the completion agenda (Center for Community College Student Engagement (CCSE, 2015). National initiatives such as Achieving the Dream, Completion by Design, and Student Success Centers have at their core a focus on student learning outcomes. Vital to increasing student learning, however, is the recognition that student engagement is central to effective classroom teaching (Kuh, 2008). Coupled with a focus on student learning and graduation rates is completion in STEM disciplines (Hagedorn & Purnamasari, 2012). Within this context, this session focuses on supports for geoscience faculty in two-year colleges, with emphasis on examining the faculty role in classroom teaching and learning. The data from this study center on the geosciences, but the lessons learned readily apply to other STEM fields.

About the SAGE2YC Project

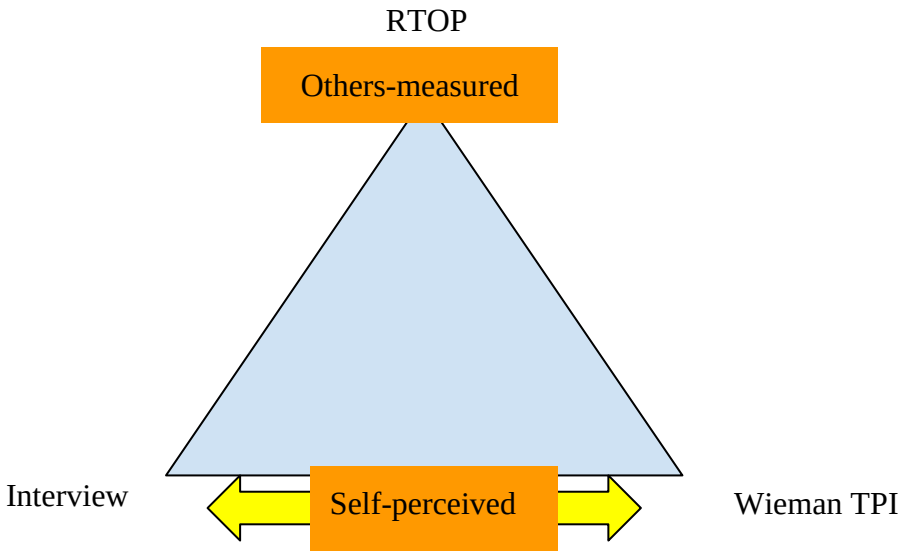
The SAGE 2YC (Supporting and Advancing Geoscience Education in Two-year Colleges) project focuses on a professional development model that provides support and training for a group of two-year college faculty members (24 change agents from 17 community colleges) over a four-year period (see project **website**: http://serc.carleton.edu/sage2yc/). In 2016, the program involved two workshops that provided training on teaching strategies and pedagogies to support the goals of the project, namely, broadening participation in geoscience programs, supporting career pathways, and increasing student success. A series of online webinars were conducted in the fall, and the 10 teams hosted their own regional workshops.

This four-year project intends to transform geoscience education in two-year colleges (2YCs) through an innovative program that focuses on 2YC geoscience faculty as "change agents" (CA). These faculty, working in teams, will implement high-impact, evidence-based instructional and co-curricular practices at their own institutions that will lead to improved STEM learning, broadened participation, and a more robust STEM workforce. They will work with administrators to institutionalize these changes, and will also propagate these practices to colleagues at 2YCs and four-year colleges and universities (4YCUs) in their region via an ongoing series of local professional development events. In year one of the project, we conducted individual interviews, observed the CA, and each of the CA filled out a teaching perspective inventory (TPI).

This work is supported by the National Science Foundation through grants 1525593, 1524605, 1524623 and 1524800.

Theoretical Framework

Change theory undergirds this grant funded research (Kotter, 2014). With the idea of student success, we wanted to help our change agents not only become more connected and able to make a bigger influence in their community, but also increase their understanding of teaching in a broader sense of helping students achieve greater success both academically and in other settings. This type of work involves change. For the purposes of this stage of the research, we wanted to focus on change in teaching practices. Thus, we utilized Bloom's revised taxonomy (Anderson & Krathwohl et al., 2000) to understand better how the faculty change agents were currently approaching their classroom teaching. The revised taxonomy includes cognitive dimensions (remember, understand, apply, analyze, evaluate, create) and knowledge dimensions (factual, conceptual, procedural, metacognitive). We looked for a focus on how change agents viewed teaching and how higher level attributes in Bloom's taxonomy were espoused and used in practice.



- RTOP : the Reformed Teacher Observation Protocol (Sawada et al., 2002)
- TPI: the Wieman Teaching Practices Inventory (Wieman & Gilbert, 2014)
- Interview: semi-structured, individual interviews on teaching philosophy and teaching

Conclusions and Implications

The analysis of this first stage of project found that faculty members already have a range of approaches to teaching. What is evident at this early point in the project is that faculty change agents still rely predominantly on passive teaching strategies and employ lower levels of Bloom's taxonomy (Anderson et al., 2000) as the majority are using teacher-centered practices and a high percentage of class time in lecture. Faculty change agents espouse great commitment to teaching and to student learning, but often lacked the training to engage in more active approaches with their students.

This work is supported by the National Science Foundation through grants 1525593, 1524605, 1524623 and 1524800.

Discussion Prompts

1. Perceptions versus observations: How do we understand the relationship between faculty's self-perceptions of their teaching practices and what's been observed in their classrooms?
2. Scholarship of teaching and learning:
   - How do we gauge students' engagement?
   - What efforts can be achieved on an individual level?
   - What types of evaluations are the most effective in terms of teaching and learning?
3. What is the influence of discipline and context on approaches to teaching? What role does isolation play in how faculty members learn about teaching and learning?
   - Many 2YC instructors are the only full-time geoscience faculty at their institutions, how do they learn strategies?
   - Because adjuncts compose more than 75% of US college and university faculty, how do they learn about ways to improve their teaching strategies?

Findings

In understanding the state of teaching practices, interpretation challenges emerged in data triangulation across instruments. The following tables provide examples of comparisons between faculty self- assessments and direct observation of a single class.

Table 1. Faculty Change Agent Total RTOP Scores Relative to Lecture Percentages

Lecture percentage	Frequency of RTOP scores			
	Traditional/ teacher-centered	Transitional/ teacher-centered	**Transitional/ student-centered**	**Reformed/ student-centered**
	0-30	31-45	46-60	60-100
0-20%				1
20-40%	1	1		
40-60%	3	3	2	
60-80%	3	2	1	
80-100%	1			

Table 2. Faculty Change Agent RTOP Sub-Score (out of 20) for Student to Student Interaction Relative to Reported Average Number of Times per Class: Have Small Group Discussions or Problem Solving

Average number per class of small group discussions	Frequency of RTOP Sub-Score for Student to Student Interaction (out of 20)			
	0-4	5-9	**10-14**	**15-20**
0	2			
1	3	4	1	
2-4	1	3	1	1

This work is supported by the National Science Foundation through grants 1525593, 1524605, 1524623 and 1524800.

Table 3. Faculty Change Agent RTOP Item Score (out of 4) for Elements of Abstraction (use of diagrams, equations, animations) to Develop Conceptual Understanding Relative to Reported Average Number of Times per Class: Show Demonstrations, Simulations, or Video clips

Average number per class	RTOP score on use of symbolic representations (out of 4)			
	1	2	**3**	**4**
0		1		
1	1		3	1
2-4	2	2	4	
5 or more	1	2		

Table 4. Faculty Change Agent RTOP Item Score for Instructor Sets up at Least One Opportunity for Students to Reflect on Their Learning Relative to Reported Use of Reflection Activity at End of Class (e.g., "one minute paper or similar method)

	No observed opportunities for students to reflect on learning	**Instructor sets up at least one opportunity for students to reflect on learning**	**Instructor sets up opportunities for students to reflect on learning with structured prompts**
Reported use of reflective activity at end of class	8	2	1
No reported use of reflective activity	7		

References

Anderson, L. W., Krathwohl, D. R., Airasian, Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., Raths, J., & Wittrock, M. C. (2000). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Hoboken, NJ: Pearson.

Center for Community College Student Engagement. (2015). *2015 cohort key findings.* Retrieved from http://www.ccsse.org/survey/survey.cfm

Hagedorn, L. S., & Purnamasari, A. V. (2012). A realistic look at STEM and the role of community colleges. *Community College Review*, *43*, 89-114. doi: 10.1177/0091552112443701

Kotter, J. P. (2014). *Accelerating change.* Boston, MA: Harvard Press.

Kuh, G. D. (2008). *Excerpt from high-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.

Sawada, D., Piburn, M.D., Judson, E., Turley, J., Flaconer, K., Benford, R., & Bloom, I. (2002). Measuring reform practices in science and mathematics classrooms: The Reformed Teaching Observation Protocol. *School Science and Mathematics*, *102*(6), .245-253.

Wieman, C., & Gilbert, S. (2014). The teaching practices inventory: A new tool for characterizing college and university teaching in mathematics and science. *CBE-Life Sciences Education*, *13*(3), 552-569.