



# Building Good Teaching Practices in STEM: Exemplar Portraits

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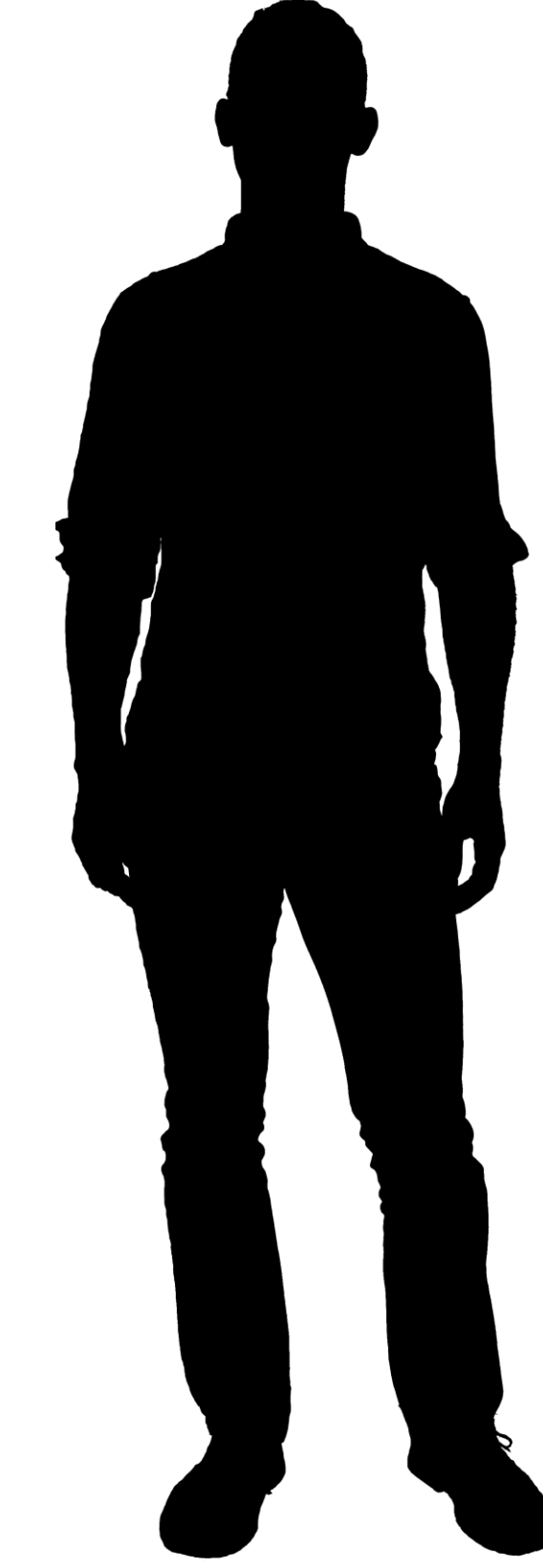
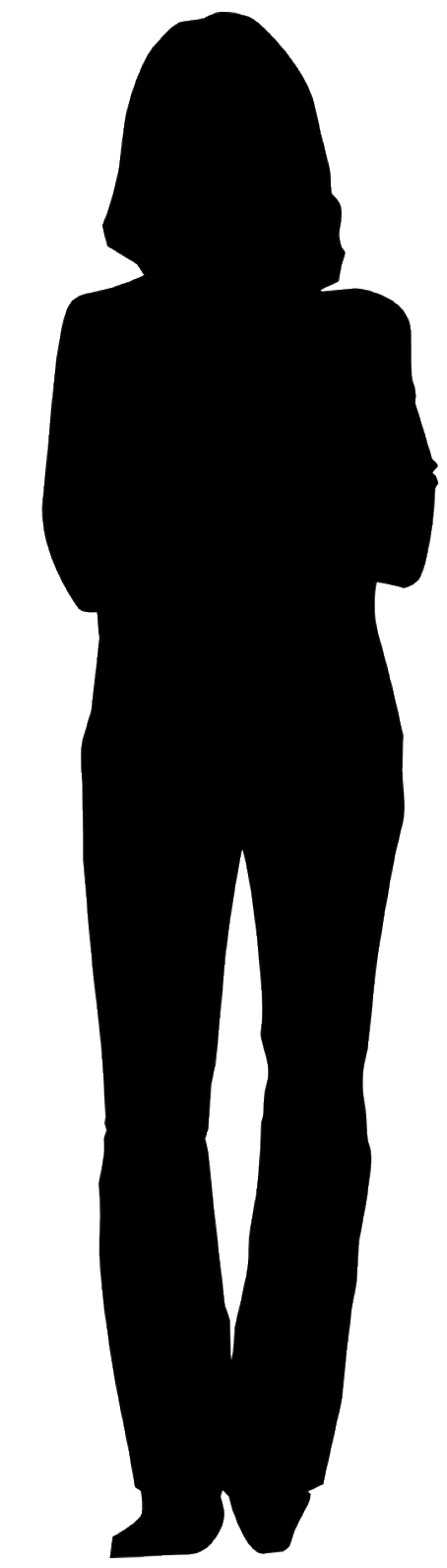
<http://serc.carleton.edu/sage2yc/index.html>

## Abstract

Increasing completion rates in STEM fields is a focus of national interest (Eagan, Hurtado, & Chang, 2010). This poster reports on initial findings from the first year of a four-year NSF grant project involving 23 geoscience faculty in community colleges around the country. Portraits of three exemplar faculty are provided, and we identify shared practices others can employ to actively engage learners.

## Our Focus

Lecture Percentage	RTOP Scores			
	Traditional/ teacher-centered	Transitional/ teacher-guided	Transitional/ student-centered	Reformed/ student-centered
0-20%				60-100
20-40%	1	1		1
40-60%	2	3	2	
60-80%	3	1		
80-100%		1		



- Presented questions requiring students to consider, discuss, and describe using **open ended questions**.

- Reminded students of **prior knowledge**.
- Students spent half of class time in small groups working on **collaborative activities**.

- “I really believe in **encouraging students’ interest** - encourage students to be comfortable in the classroom, and **comfortable asking questions**.”*

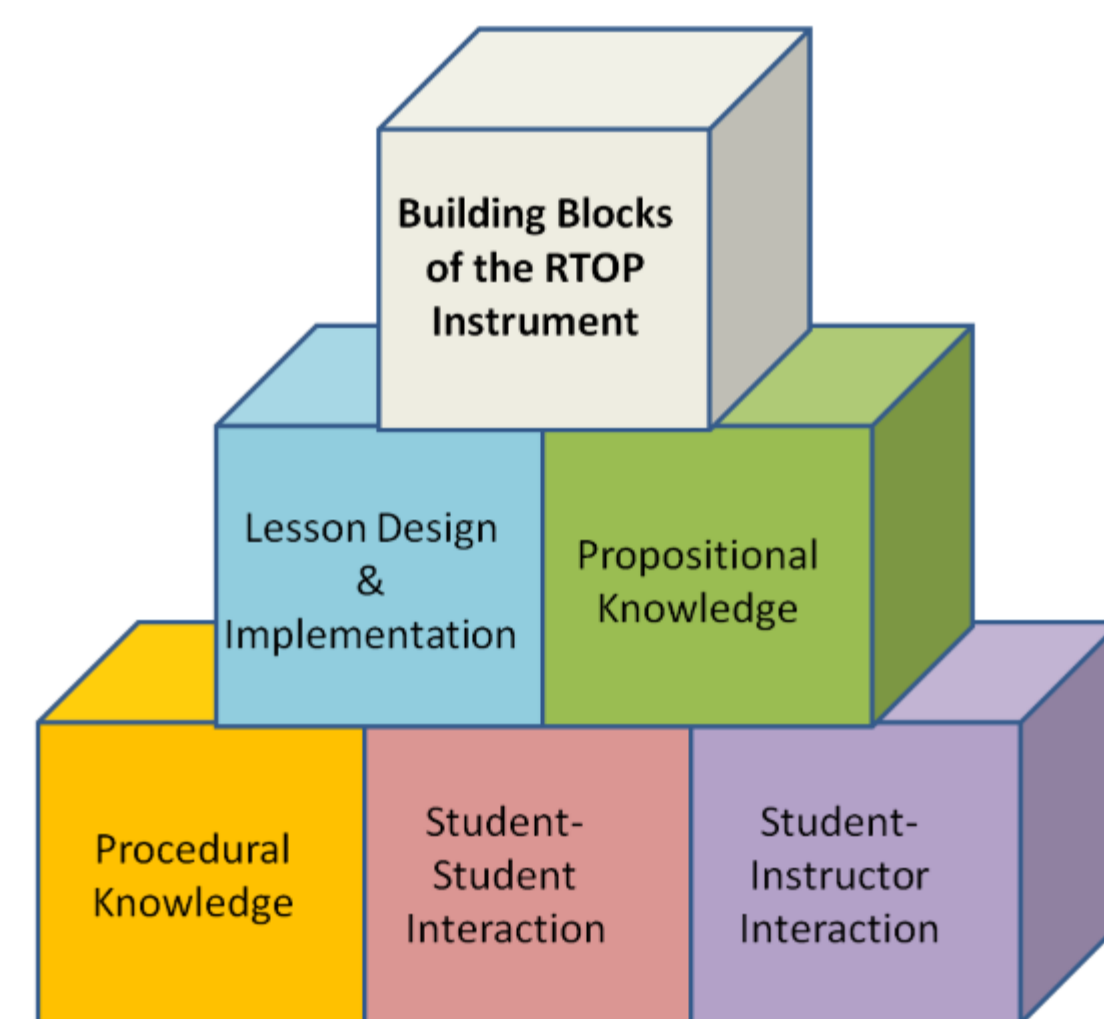
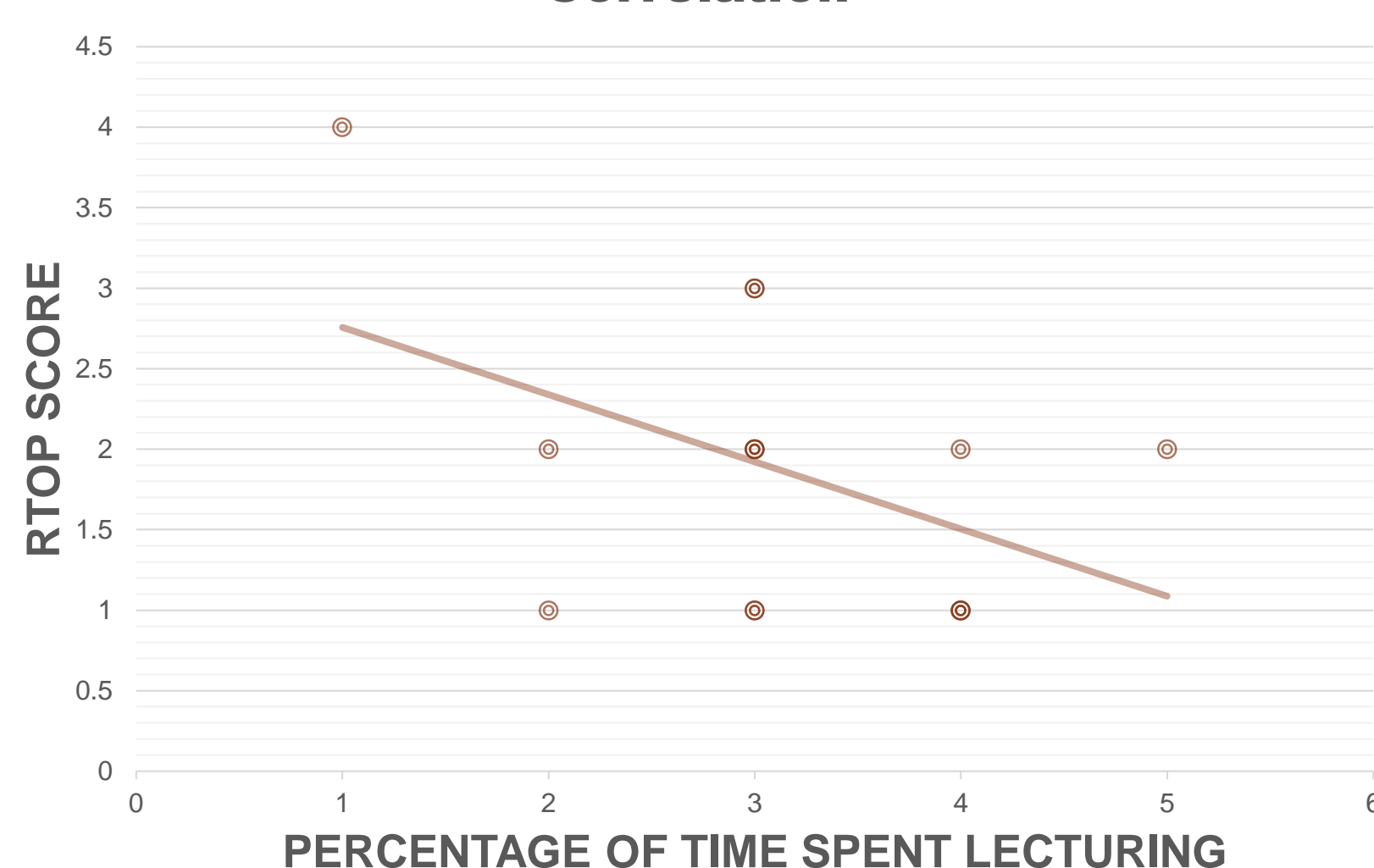
- Allowed **students’ lines of questioning to guide class** and tied information to everyday experiences.

- Presented information in multiple ways** (e.g., graphs, charts, sketches).
- Utilized **multiple methods to assess student understanding** (e.g., kinesthetic activities).

- “I try to have them **learn by doing**...I provide students some baseline information, and ask them questions, give them problems to work on that requires them to **understand and synthesize**...”*

- Utilized full class discussion and encouraged **student participation**.
- Presented **learning objectives** at the beginning of class.
- Connected examples to students’ experience** characteristics of their state’s geography.
- “If you try to **pull them out of their shells**, I do find they are more actively learning. They do tend to learn the material better.”*

Lecturing Time vs. RTOP Score Correlation



Reformed Teaching Observation Protocol (RTOP; see <http://tinyurl.com/okamkn3>)

## Practices to Actively Engage Learners

### What distinguishes student-centered teaching practices?

- Respect** for students' prior knowledge and preconceptions.
- Encouragement** for students to seek and value alternative modes of investigation and problem solving.
- Lessons directed by **ideas** originating from students.
- Teaching for conceptual understanding, not memorization.
- Use of elements of abstraction (graphs, concept maps, etc.).
- Information is **connected** to students’ experiences.
- Allowing students to test hypotheses or predictions, and **engage** in critical evaluation of evidence.
- Opportunities for students to **reflect** on their learning.
- Opportunities for **collaborative activities** and meaningful interaction between students.
- Climate of respect for differing opinions and **divergent thinking**.
- Role of teacher becomes “teacher as listener.”
- Teacher **facilitates** discussion and encourages students’ exploration, not always providing concrete answers.

### What can I do?

- Implement High Impact Practices (see AACU [https://www.aacu.org/sites/default/files/files/LEAP/HIP\\_tables.pdf](https://www.aacu.org/sites/default/files/files/LEAP/HIP_tables.pdf))
- Utilize active learning strategies (e.g. [www.usf.edu/atle/documents/handout-interactive-techniques.pdf](http://www.usf.edu/atle/documents/handout-interactive-techniques.pdf))
- Build on authentic learning—activities using real-world problems and student-directed learning (e.g. [net.educause.edu/ir/library/pdf/ELI3009.pdf](http://net.educause.edu/ir/library/pdf/ELI3009.pdf))
- Incorporate Team Based Learning (see <http://www.teambasedlearning.org/>)
- Use Student-center teaching practices (see Weimer: [http://www.dartmouth.edu/~physteach/ArticleArchive/Weimer\\_excerpt.pdf](http://www.dartmouth.edu/~physteach/ArticleArchive/Weimer_excerpt.pdf))

### References:

Eagan, M. K., Hurtado, S., & Chang, M. J. (2010, October). What matters in STEM: Institutional contexts that influence STEM bachelor’s degree completion rates. In *annual meeting of the Association for the Study of Higher Education, Indianapolis, IN*.  
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