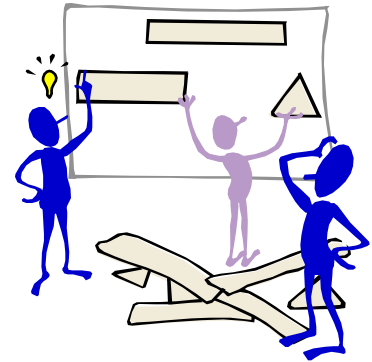


# Embedded experts:

A productive approach to transforming undergraduate STEM education



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## Faculty need...

- **Expertise** in pedagogy... within the discipline
- **Time** to learn about and implement new strategies
- **Coaching, reflection & support** through implementation

Borrego, M., & Henderson, C. (2014). *Journal of Engineering Education*, 103(2), 220–25

Henderson, C., Dancy, M., & Niewiadomska-Bugaj, M. (2012) *Phys. Rev. Spec. Top – Phys. Ed. Rsrch.*, 8 (2), 020104



## An experimental approach: The Embedded Expert

Postdoc *or* other trained person offers:

- Disciplinary knowledge
- Pedagogical expertise
- Human capital & labor (i.e., TIME!)
- Ongoing coaching and feedback
- “Embedded” within department

*Your friendly neighborhood  
embedded expert*

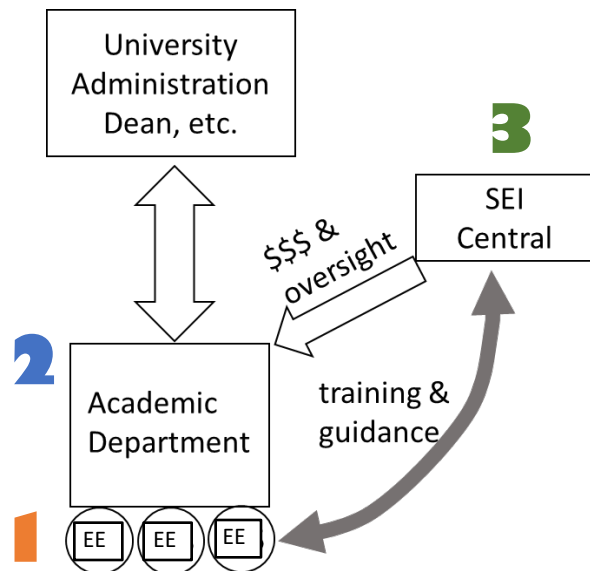


## Science Education Initiative (SEI)



**Competitive grant program** for depts.  
focused on course transformation

### Key elements:



- 1** Use of many **Embedded Experts** (postdocs) to partner with faculty
- 2** **Departmentally-led** program with departmental director
- 3** **SEI Central** to oversee the project



## SEI at Two Institutions

	U. Colorado 	U. British Columbia 
# Years	8	7 (ongoing)
Total Funding	\$5.3M USD	~9.7M USD
Funding / Dept.	\$150-860K (ave \$650K)	\$300K-\$1.75M (Ave \$1.68 M)
# Depts.	7	7
# EE's / Dept.	1-3	2-5

The SEI “existence proof”: *It is possible to make large changes in teaching in a STEM department*

	CU 	UBC 
<b>Courses impacted</b>		
# courses	103	146
% of all courses in Dept.	35%	~33%
<b>Students impacted</b>		
Annual enrollment	18,000	43,000
% of annual enrollment	50%	59%
<b>Faculty impacted</b>		
# faculty	190	Not available
% of departmental faculty	66%	Not available

Chasteen et al., Phys. Rev. Spec. Top. – Phys. Ed. Rsrch., 11, 020110 (2015); Wieman (in press)

But you don't need \$5M to use this approach

This idea seems to have legs.... several other programs are using various types of “embedded experts” and fewer of them\*

- Single departmental postdocs
- Central postdocs
- Faculty Learning Communities
- Faculty “ambassadors” in departments
- Instructors



hhmi



BAY VIEW  
ALLIANCE



*\*The success of these scaled-down initiatives remains to be seen*

Are *you* using embedded experts?

*Could you be?*

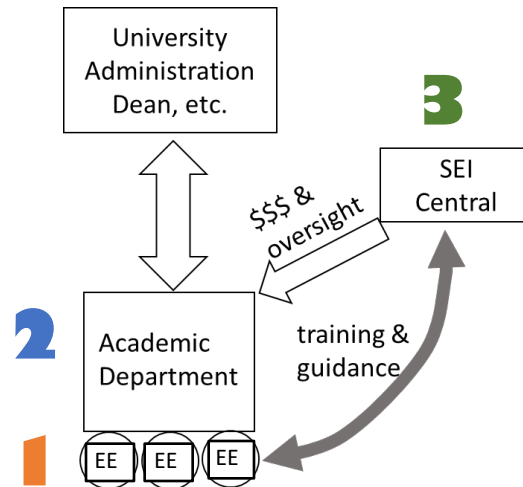
Embedded experts provide **human capital to departments:**  
I.e., expertise & time

Lessons learned from the SEI about how to make it work well can inform a wide range of embedded expert models!

*(Let me know if you'd like to see the upcoming SEI Handbook!)*

To be successful, the Embedded Expert needs:

- 1 To be right for the job:**  
Good content knowledge, flexible, good listener and facilitator
- 2 Strong departmental partners:** Engaged & effective department director, supportive chair, some engaged faculty, development of vision & sense of urgency.
- 3 Community & training:**  
Central training, reflective oversight, a professional community, oversight, & access to assessment expertise



## TRESTLE: Transforming Education, Stimulating Teaching and Learning Excellence

- NSF-IUSE funded, testing SEI model at 7 research universities



**Question:** *Can we propagate change through a smaller infusion of resources and expertise, in different contexts?*

**Approach:** Amplify effects of experts through **community building** (within and across departments and institutions):

- Community building is a shared vision across institutions
- Less “reinventing the wheel”
- Connect to people and resources

A trestle provides networked support for collective action



## Conclusion & Questions

- Embedded Experts are a productive model for STEM education transformation
- Many types of people and programs can be considered embedded experts, as long as they work within departments to provide expertise and time
- Embedded experts need several supports to be successful

In development: *The SEI Handbook, A Guide to the Embedded Expert Model*

More about TRESTLE at <http://colorado.edu/csl/TRESTLE>

More about SEI at <http://colorado.edu/sei> and <http://www.cwsei.ubc.ca/>

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