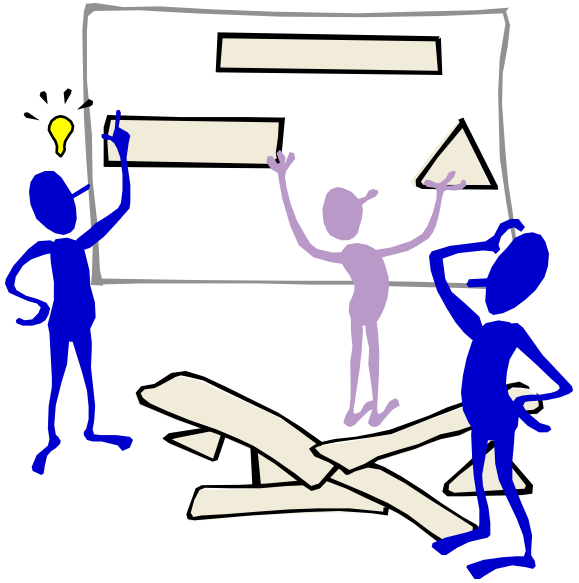
Embedded experts:

A productive approach to transforming undergraduate STEM education



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BAY VIEW ALLIANCE

SEI

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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

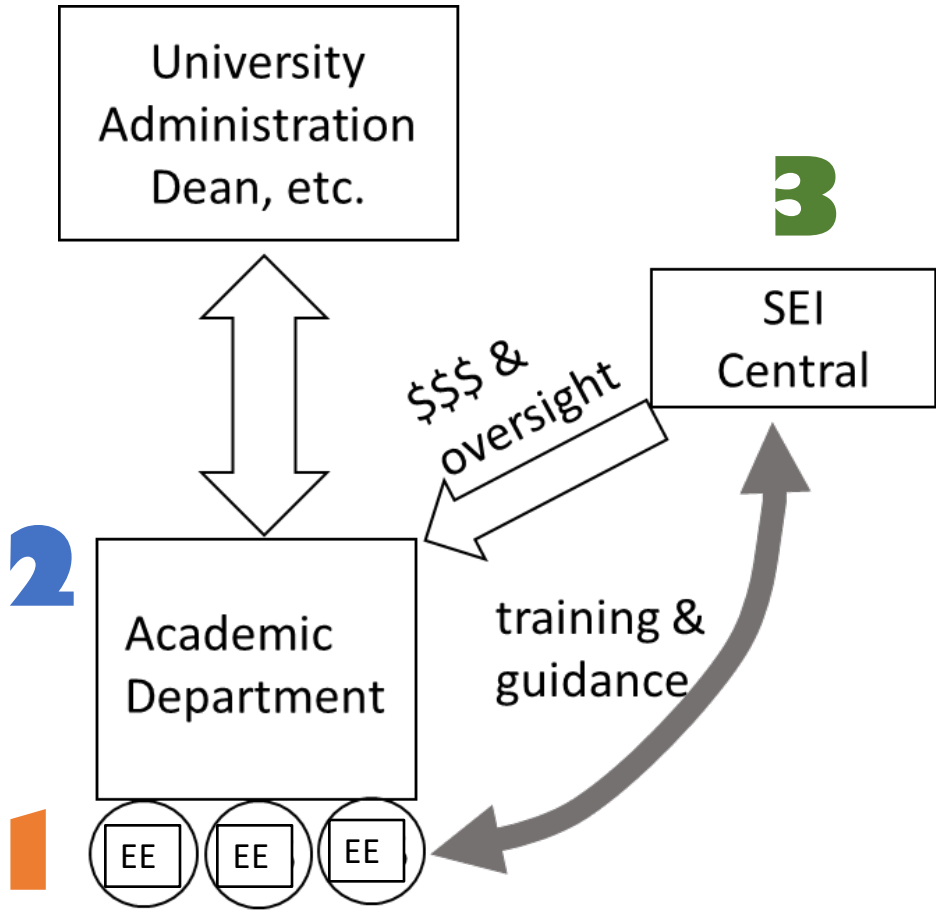
Your friendly neighborhood embedded expert

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
Courses impacted		
# courses	103	146
% of all courses in Dept.	**35%**	**~33%**
Students impacted		
Annual enrollment	18,000	43,000
% of annual enrollment	**50%**	**59%**
Faculty impacted		
# 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

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

Are *you* using embedded experts?

Could you be?

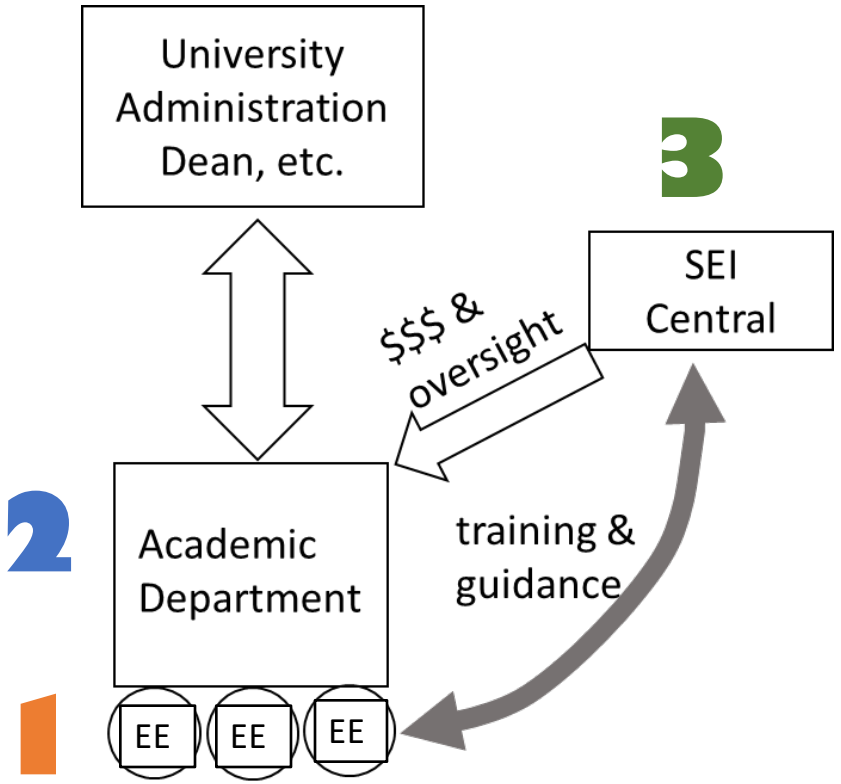
Embedded experts provide **human capital to departments:** I.e., expertise & time

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

BAY VIEW ALLIANCE

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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