

# PhysTEC 2016

## **Transforming Secondary Math Teacher Preparation: Ideas for Physics Teacher Programs**

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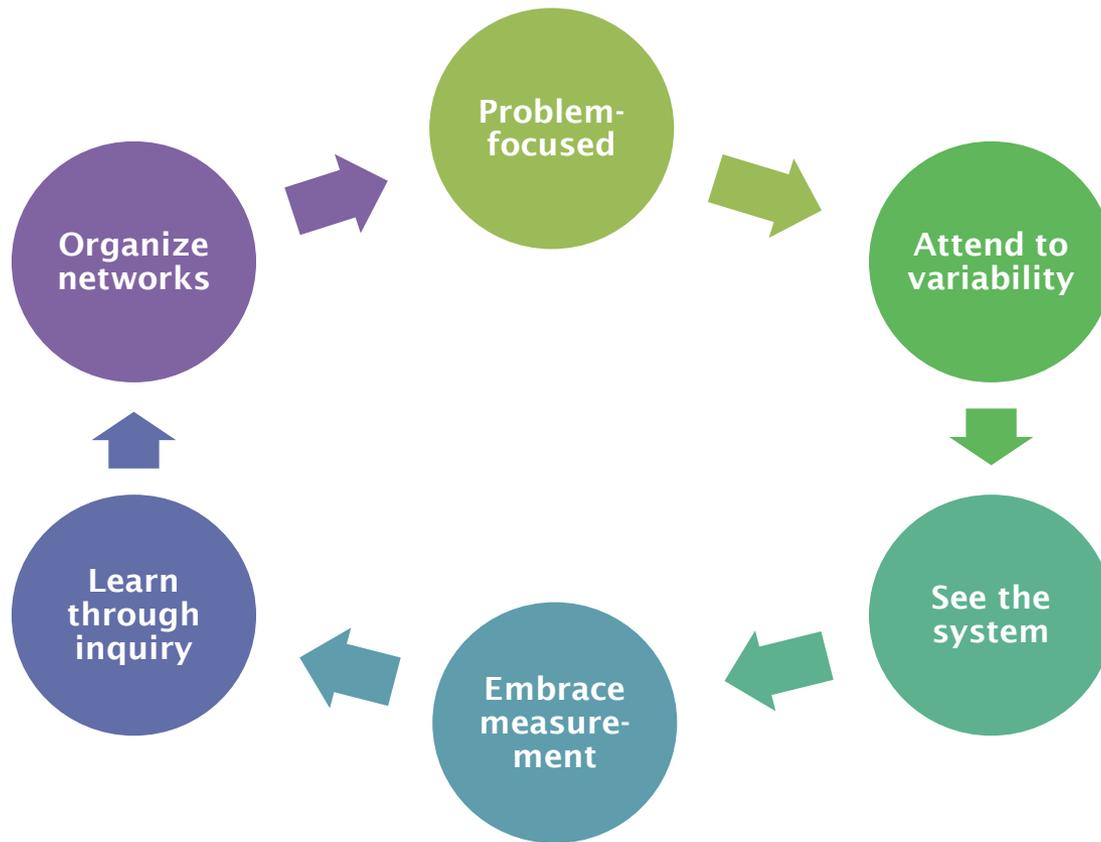


“Building Scale: Using  
the NIC Design to  
Transform  
Mathematics Teacher  
Preparation”

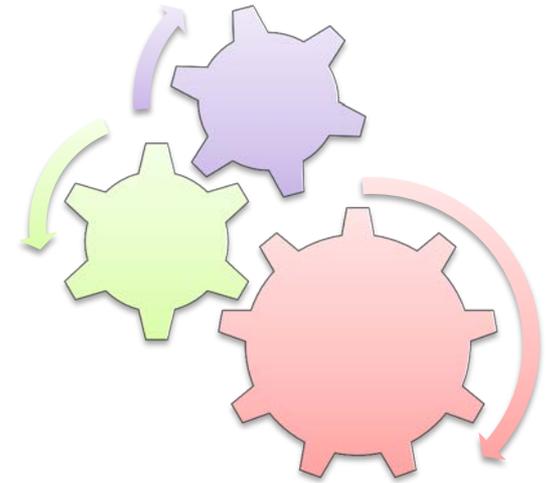
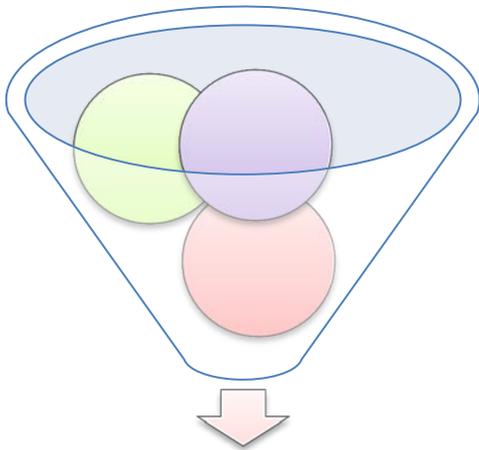


# Improvement Science

## *Get Better at Getting Better*



*Every system is  
perfectly designed  
to get exactly the  
results it  
achieves.*



# Why Improve? A Perfect Storm of Factors for Mathematics Teacher Preparation

Questions of teacher preparedness

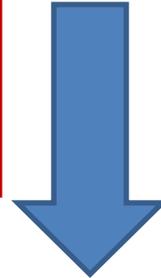


New competitors

College readiness



Declining US standing



Accountability

Rising labor demand for math literacy



Changing student profiles



National attainment goals



# Challenges of Complexity

- Innovation abounds!!! How to share?  
How to spread?
- Cause/effect not always clear
- Results take time, difficult to track,  
understand status
- Varying institutional buy-in to change
- Hard to share knowledge, lessons to  
expand impact



# Present Approaches to Advance Change INSUFFICIENT!!!

- Share news, information, practices
- Analyze issues – distribute reports
- Organize support for common goals
- Develop tools, metrics, frameworks
- Convene groups
- Recognize excellence thru awards
- Promote promising practices





**Carnegie Foundation**  
for the Advancement of Teaching

***Accelerating Our Capacity to  
Learn to Improve in Education:  
Networked Communities Engaged  
in Improvement Research***

***Paul LeMahieu***

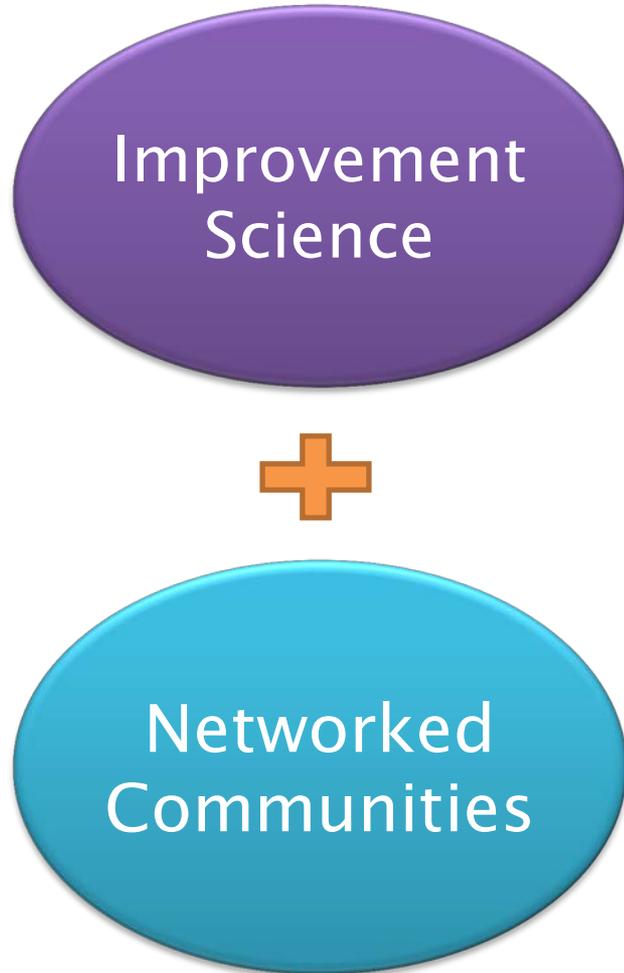
***Senior Vice President, Carnegie Foundation for  
the Advancement of Teaching***

# Networked Improvement Communities: What are they?

## Reconceiving the challenge:

- How to implement complex ideas reliably and at scale
- How to move from ***fidelity*** of implementation to ***integrity*** of implementation

# Integrating Two Big Ideas



- ✓ Collaboration toward common goal
- ✓ Continuous improvement
- ✓ Shared knowledge, data
- ✓ Accelerated learning

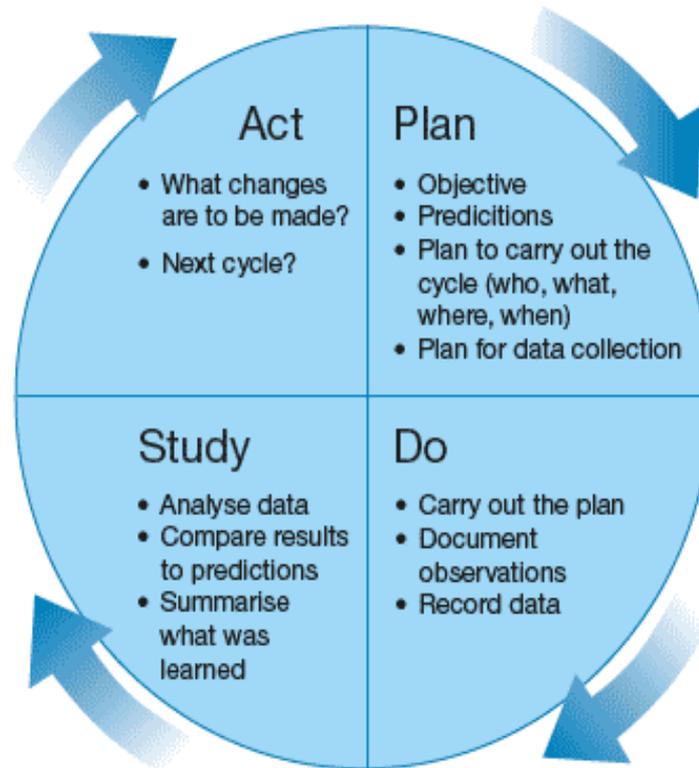


# Key Tenets

- Work is problem-specific, user-centered
- Focus on variation in performance
- Understand the system that produces the outcomes
- Cannot improve at scale what cannot be measured
- Use disciplined inquiry to drive improvement
- Accelerate learning through networked communities



# Rapid Cycle of Prototyping, Testing, and Revision



# Mathematics Teacher Education Partnership (MTE-Partnership)





- 39 Partnership Teams – 31 States:**
- **100 universities and community colleges**
  - **Over 100 school systems**

# The Issues

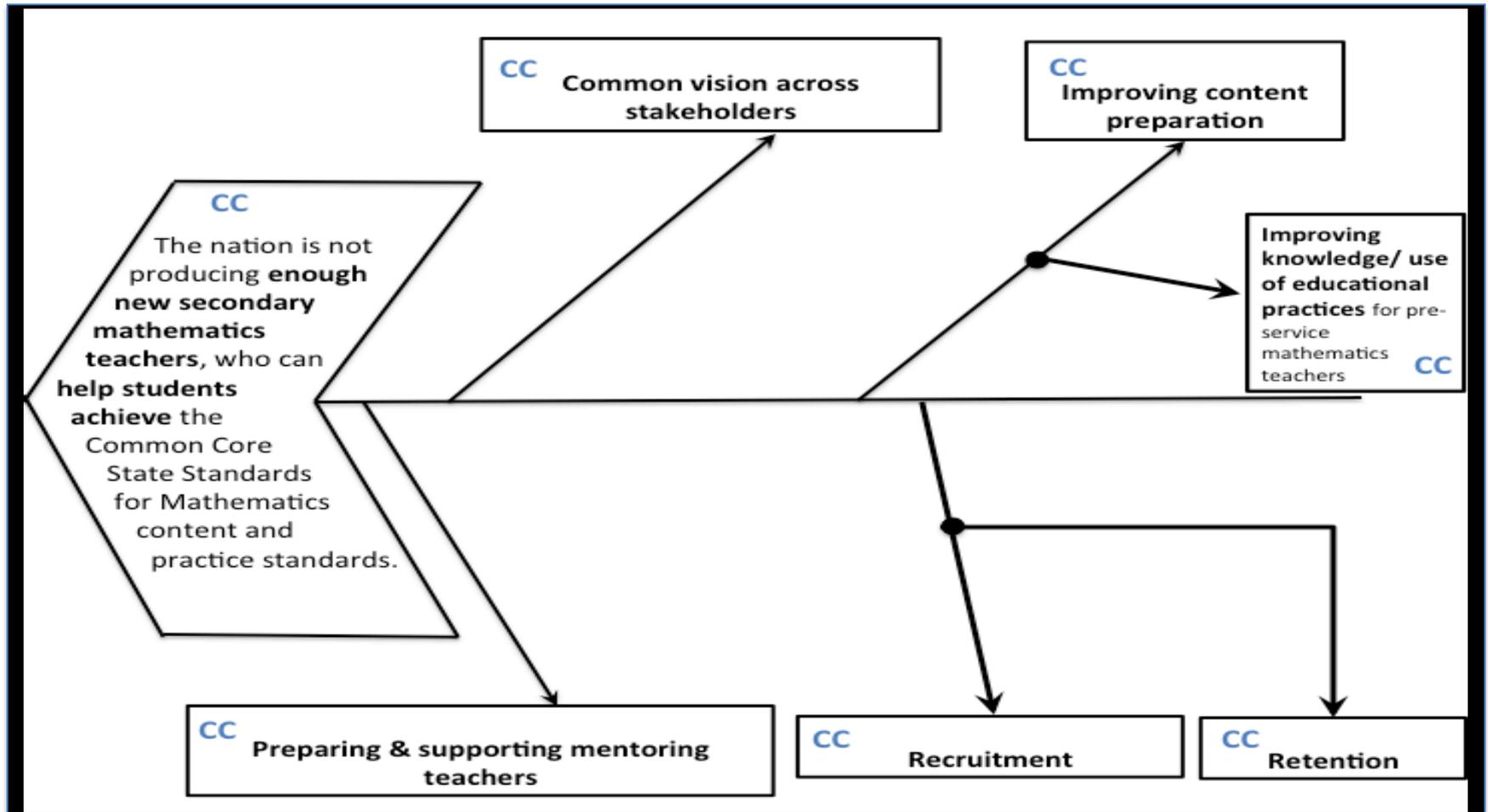
- New secondary mathematics teachers need to be prepared differently in light of the *Common Core State Standards* and other college- and career-ready standards, the *Mathematical Education of Teachers II*, and NCTM's new *Principles to Actions*.
- Across the nation, there is a shortage of secondary mathematics teachers.

# MTE-Partnership Goal

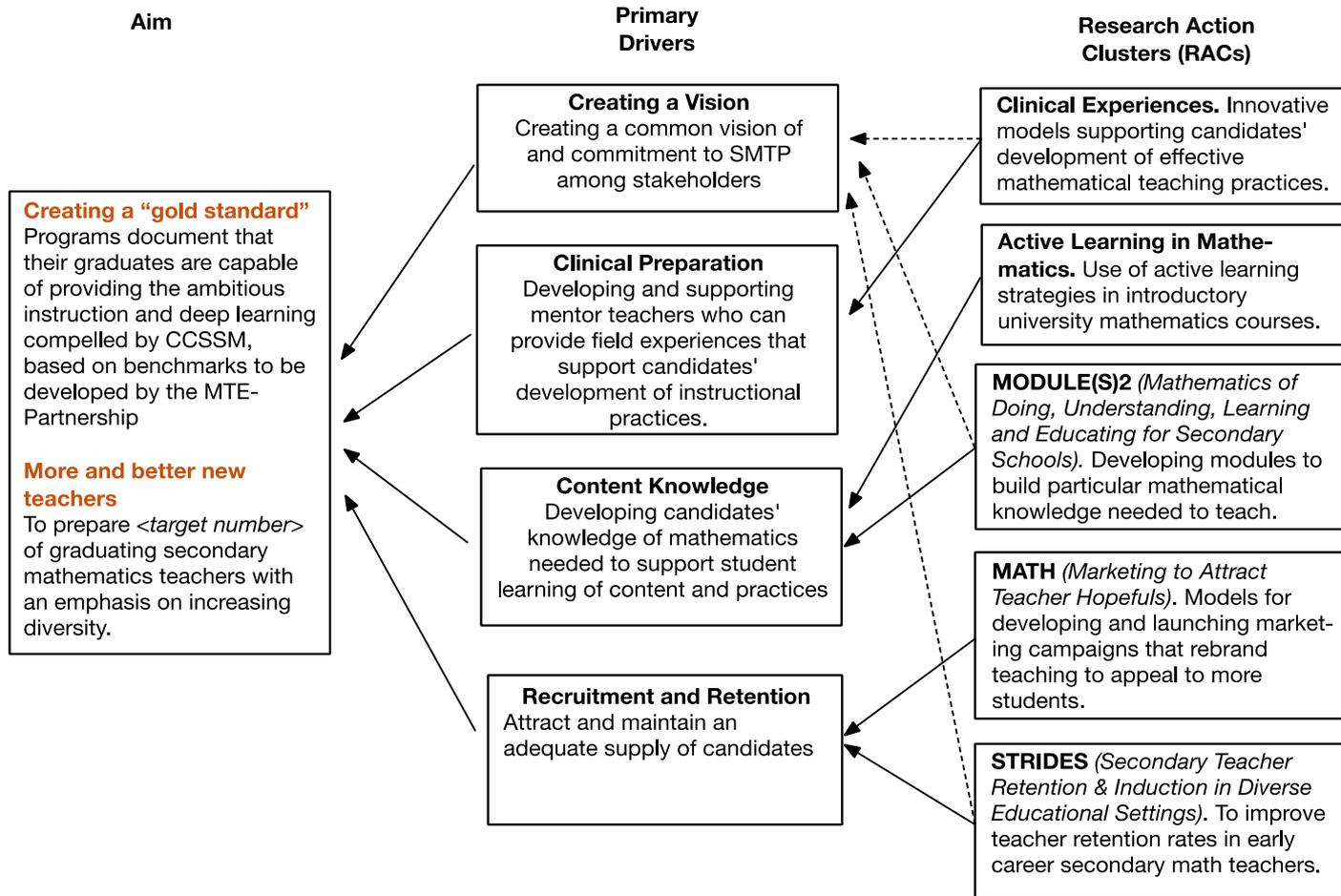
To *transform* secondary mathematics preparation to ensure an adequate supply of new teachers who can promote mathematical excellence in their future students.

**“To set the bar for the nation in secondary mathematics teacher preparation”**

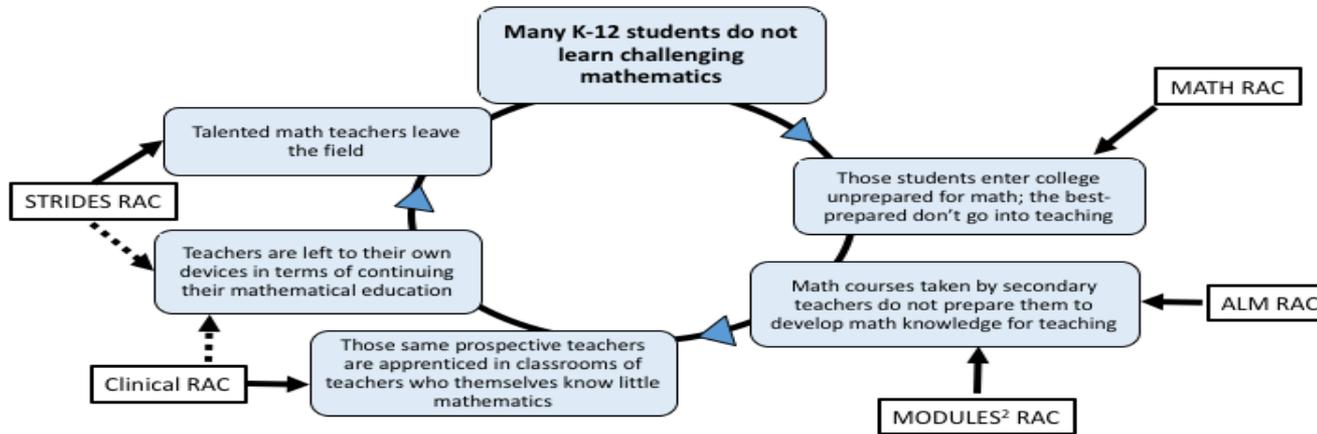
# Root Cause Analysis



# MTE-P Driver Diagram



# MTE-Partnership: Addressing the Downward Cycle In Mathematics Education



## MTE-Partnership's Research Action Clusters (RACs)

- **MATH: Marketing for Attracting Teacher Hopefuls** -- *Moving beyond advertising to attract candidates*
- **ALM: Actively Learning Mathematics** -- *Improving instruction in introductory university mathematics classes*
- **MODULES<sup>2</sup>: Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools** – *Developing materials to address specific mathematical needs of secondary math teachers*
- **Developing Effective Clinical Experiences** -- *Mentor professional development; alternative models*
- **STRIDES: Secondary Teacher Retention & Induction in Diverse Educational Setting** – *Retaining new math teachers in the profession*

[www.MTE-Partnership.org](http://www.MTE-Partnership.org)



# Design Principles

- Making a real contribution -- Improving, not just studying. Transforming, not just tweaking.
- Building a common focus and language -- see Guiding Principles.
- Continuing to build partnerships. And harnessing those partnerships in the effort.
- Being able to demonstrate our success – in a scientifically rigorous manner.
- Engaging in “continuous improvement” – improvement is a process, not an outcome.
- Then scaling improvements across the network.
- Building an infrastructure to support the network.



# Measures -- An essential component of the NIC model

- Measures of candidate quality:
  - ✓ Common classroom observation protocol (piloting the MCOP2)
  - ✓ Mathematical knowledge for teaching (exploring possibilities)
- Measures of program quality (aligned with the *Guiding Principles*):
  - ✓ Candidate perceptions of preparedness
  - ✓ Employer perceptions of preparedness
  - ✓ Program self-evaluation

# Challenges to Improvement

- Maintaining engagement:
  - This is largely a volunteer effort, which means that it adds another layer to people’s jobs.
  - Mathematicians may not see this as “Job 1” – particularly non math-content related activities.
  - K-12 personnel may not see this as “Job 1” – particularly given the pressures to improve the practices of their current teachers.

# For More Information

- [www.MTE-Partnership.org](http://www.MTE-Partnership.org)
- Howard Gobstein, Co-Director
- Gary Martin, Co-Director  
(and creator of many of these slides)