

# Evaluation & Research in the ATE Program

December 10, 2014

*The webinar will begin  
at 1 p.m. Eastern*

**EvaluATE**  
Evaluation Resource Center for  
advanced technological education

## Introductions



Jason

**Jason  
Burkhardt**



**Lori  
Wingate**



**Kirk  
Knestis**



**Will  
Tyson**



**EvaluATE**  
Evaluation Resource Center for  
advanced technological education



WESTERN MICHIGAN UNIVERSITY


**Hezel  
ASSOCIATES**

**PathTech**




This material is based upon work supported by the National Science Foundation under grant number 1204683. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the presenters and do not necessarily reflect the views of NSF.

## Behind the Scenes




Jason






**Mike Lesiecki**



**Janet Pinhorn**



**Emma Perk**



## Webinar Materials



Jason



Slides



Recording



Supporting materials  
by Lori, Kirk, and Will

Available from [www.evalu-ate.org](http://www.evalu-ate.org)

## Objectives



Jason

- ① Understand the basic organization and content of the *Common Guidelines for Educational Research and Development*
- ② Be able to distinguish between evaluation and research in NSF-funded work
- ③ Understand the need and opportunities for ATE targeted research



## The Common Guidelines for Education Research and Evaluation

Lori

2014 ATE PI Conference Session  
**ATE Research and Evaluation:  
Responsibilities and Opportunities**





Lori




Lori Kirk Will

session presentations available from: [bit.ly/ate-con-2014](http://bit.ly/ate-con-2014)





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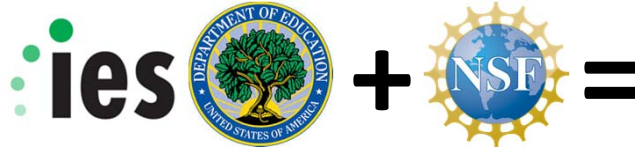


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**Common Guidelines for  
Education Research and Development**

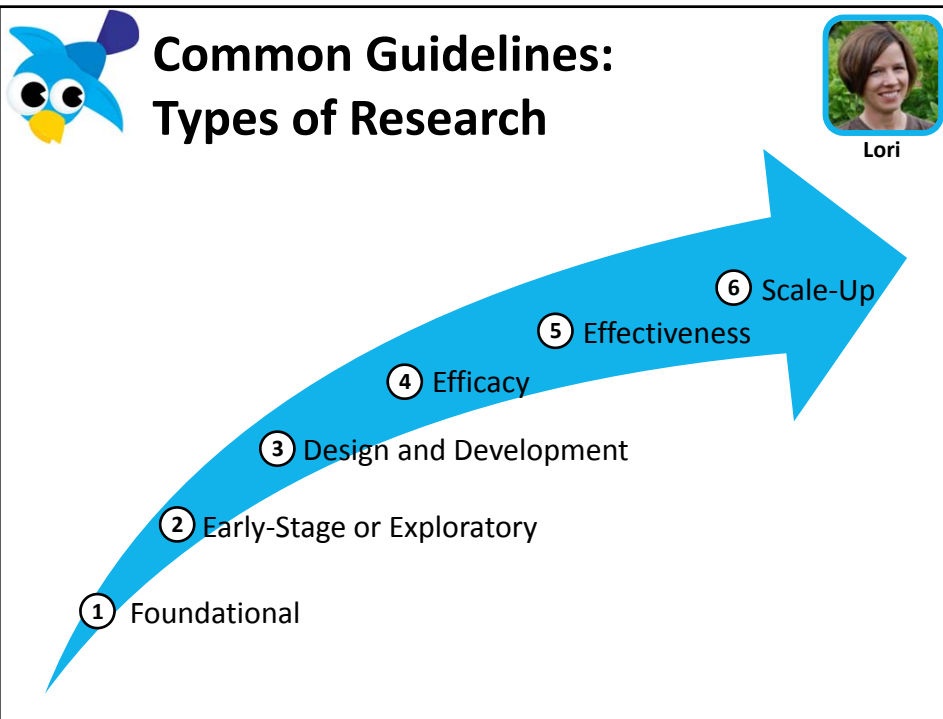
A Report from the Institute of Education Sciences,  
U.S. Department of Education  
and the National Science Foundation  
August 2013





## Common Guidelines for Education Research and Development

- Classification of 6 main types of research
- Explanation of agencies' expectations for each research type's
  - Purpose
  - Justification
  - Evidence
  - External feedback
- **NOT merit review criteria!**



## Foundational Research



Lori

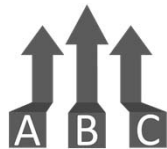


advance the frontiers of education and learning; develop and refine theory and methodology; and provide fundamental knowledge about teaching and/or learning

## Early-Stage or Exploratory Research



Lori



investigate approaches to education problems to establish the basis for design and development of new interventions or to provide evidence for whether an established intervention is ready to be tested in an efficacy study

## Design and Development Research



Lori



develop new or improved  
interventions to achieve well-  
specified learning objectives

## Efficacy Research



Lori

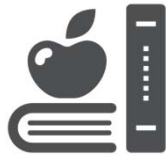


determine whether an intervention  
or strategy can improve outcomes  
under “ideal” conditions

## Effectiveness Research



Lori



estimate the impacts of an intervention when implemented under conditions of routine practice

## Scale-Up Research



Lori



estimate the impacts of an intervention under conditions of routine practice *and* across a broad spectrum of populations and settings



## Start Here



Lori



### Important problem or issue in education



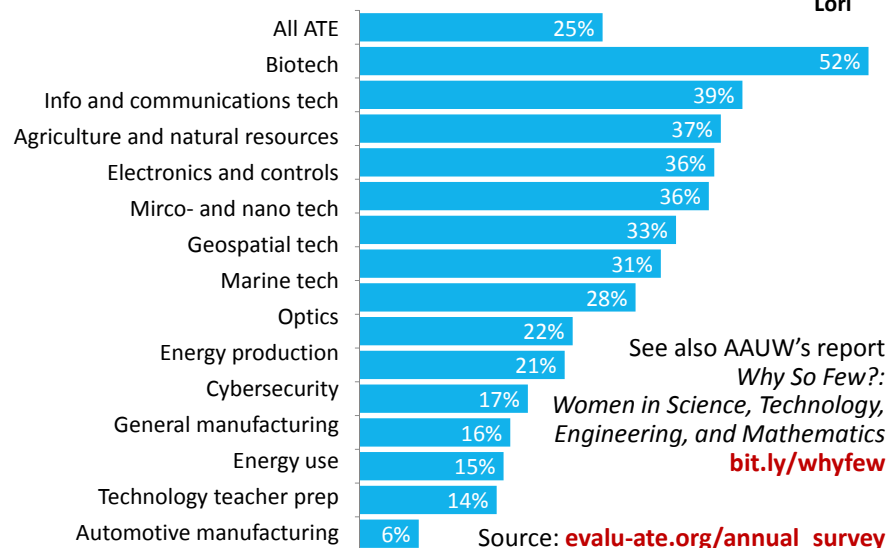
- What are you curious about?
- What pressing problem do you want to help solve?

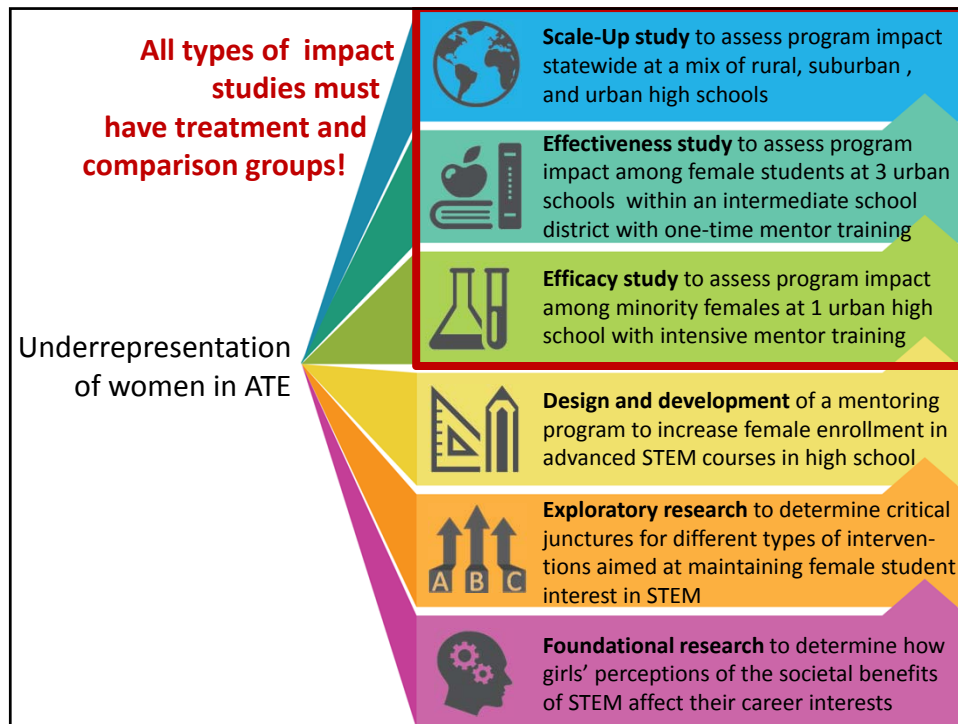
**Common concern throughout ATE:  
Women are severely underrepresented  
in ATE disciplines**

## Example: Women in ATE



Lori





## Start Here



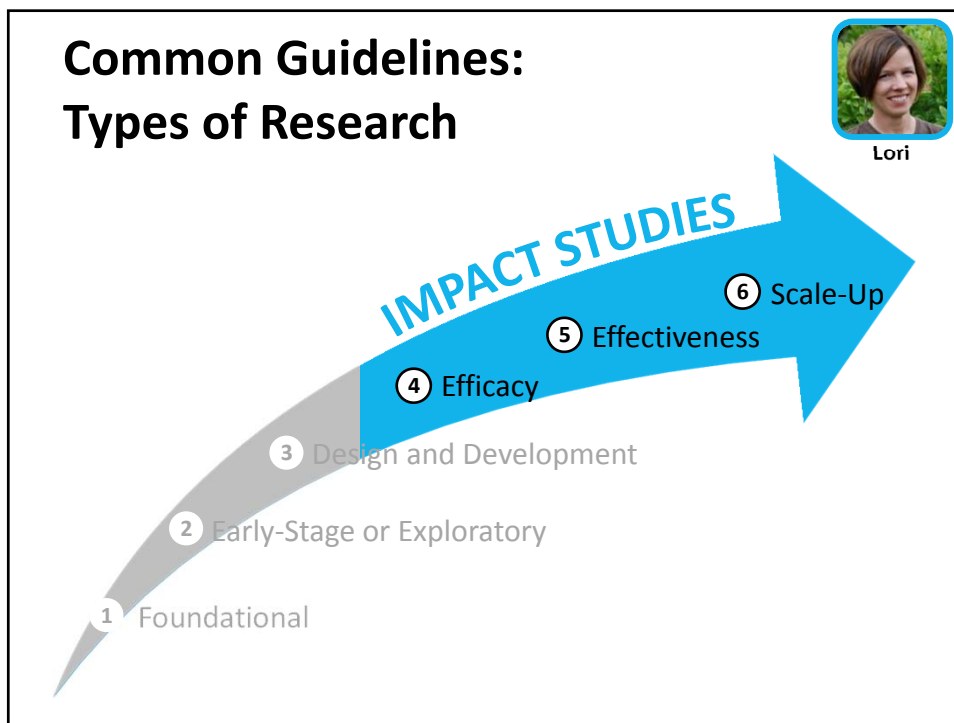
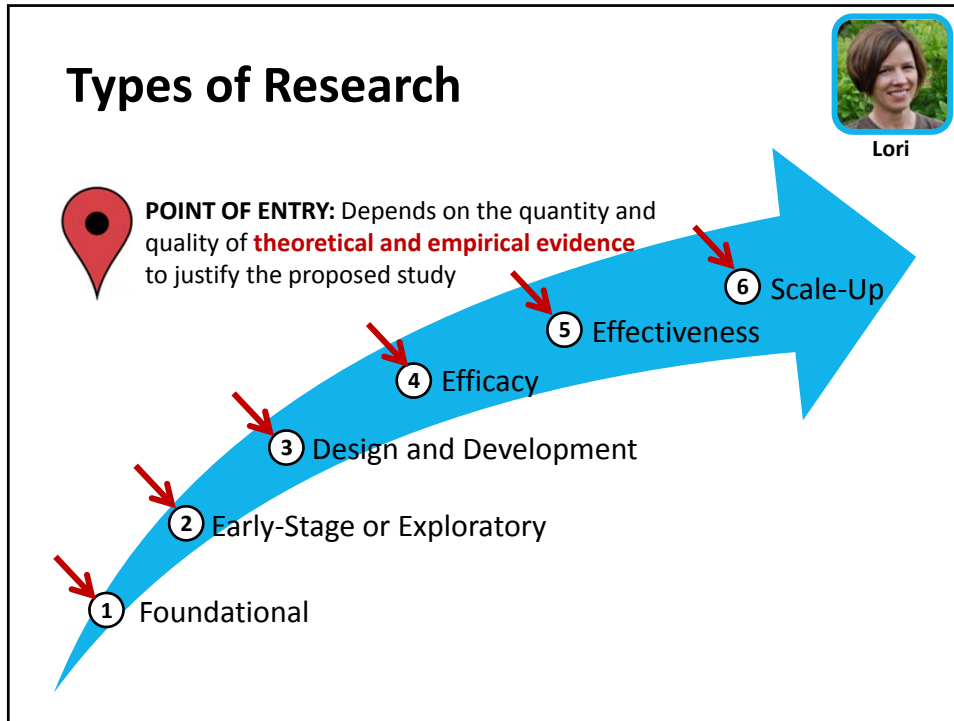
Lori



### Important problem or issue in education



- What are you curious about?
- What pressing problem do you want to help solve?
- **Do you have theoretical or empirical evidence to justify pursuing your interest via research?**





## Common Guidelines for Education Research and Development

- Classification of 6 main types of research
- Explanation of agencies' expectations for each research type's
  - Purpose
  - **Justification**
  - Evidence
  - External feedback

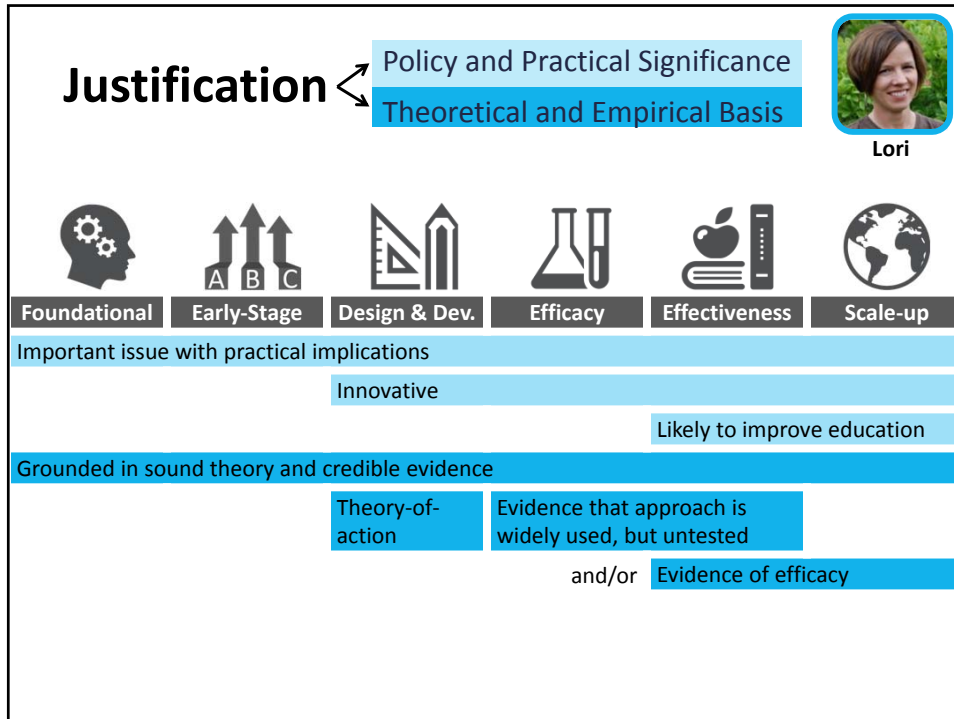
## Justification



Lori

Policy and Practical Significance → *Why it matters*

Theoretical and Empirical Basis → *How we know it matters*




**ies** + **NSF** =

**Common Guidelines for Education Research and Development**

- Classification of 6 main types of research
- Explanation of agencies' expectations for each research type's
  - Purpose
  - Justification
  - Evidence
  - External feedback


## Evidence

  
**Lori**

Project Outcomes ➔ *What the project will produce*







Research Plan ➔ *How the inquiry will be conducted*

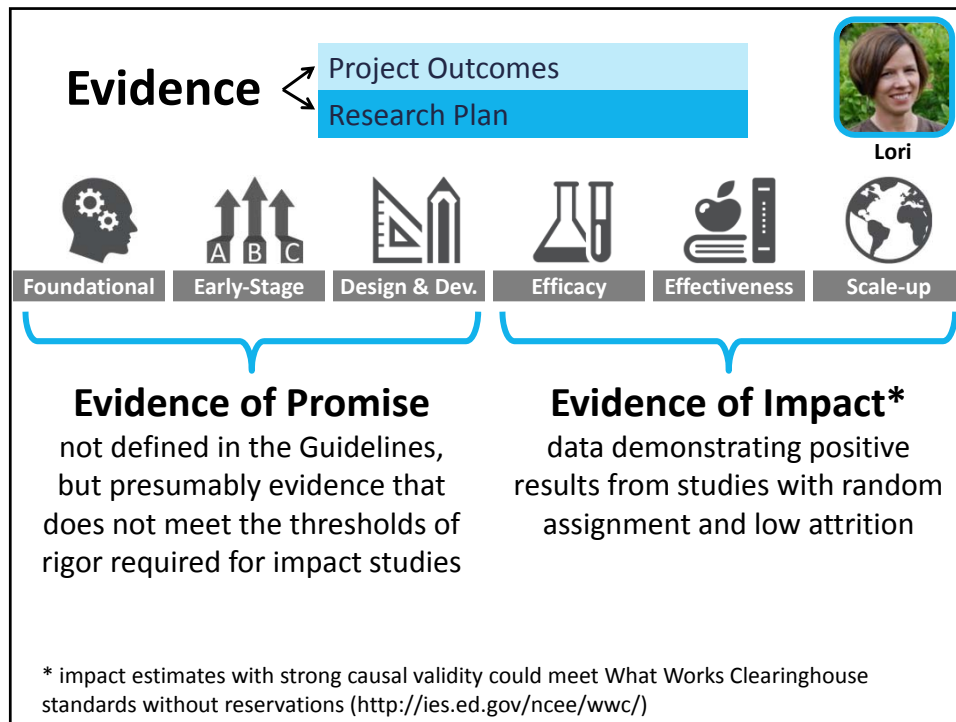
## Evidence

  
**Lori**

Project Outcomes

Research Plan

					
Foundational	Early-Stage	Design & Dev.	Efficacy	Effectiveness	Scale-up
Advances in knowledge Findings to inform future research	Evidence about how to influence education outcomes	Documentation of intervention and research Theory-of-action Impact measures and pilot data	including treatment and comparison conditions Impact estimates Implications for theory-of-action		
<b>DESCRIBE....</b>					
Research questions, design, setting, methods, instruments, sampling, analysis, reporting					
		Plan for collecting data on future implementation	Outcomes of interest; minimum impact size Validity/reliability assurance Data collection on implementation, context, and comparison conditions		




**ies** + NSF =


**Common Guidelines for  
Education Research and Development**

- Classification of 6 main types of research
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  - Purpose
  - Justification
  - Evidence
- External feedback


## External Feedback




Lori




Foundational




Early-Stage




Design & Dev.



Efficacy



Effectiveness



Scale-up

Peer review of the proposed project

Ongoing monitoring and review by funding agency


External review panels or advisory boards

Third-party evaluator

Peer review of publications and conference presentations

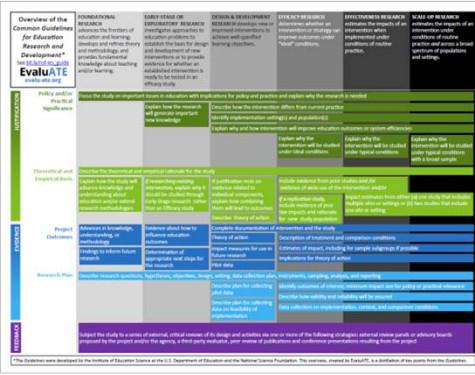
Contracted/coordinated by funded project

## Resources



Lori

### The Common Guidelines for Education Research and Development



The Overview of the Common Guidelines for Education Research and Development is a synthesis of the research and development process. The overview is organized by the following categories: Overview of the Common Guidelines for Education Research and Development, Early-Stage or Design & Development, Efficacy Research, Effectiveness Research, and Scale-up Research.

**TYPE 1: FOUNDATIONAL RESEARCH** to advance the frontiers of education and learning; develop and refine theory and methodology; and provide fundamental knowledge about teaching and/or learning

**Justification**

**Policy and/or Practical Significance**

- Address important research questions related to education and learning
- Have clear implications for policy and/or practice (direct relationship to student outcomes not required)

**Theoretical and Empirical Basis**

- Outline the study's theoretical and empirical bases
- Explain why the research is needed
- Describe whether and how the study will
  - identify or explore important new constructs in education and learning
  - extend understanding of current constructs
  - explain understanding of relationships among the constructs under investigation and/or
  - extend research methodologies for advancing the evidence base to support improved policy or practice

**Evidence**

**Project Outcomes**

- Advances in theory, methodology, and/or understanding of important constructs in education
- Findings that could serve as basis for future studies

**Research Plan**

- Define the study's key conjectures or hypotheses, questions, and objectives—derived from the study's theoretical and empirical justifications
- Describe the study design in detail, including:
  - population of interest
  - sampling or selection methods
  - sample size
  - data analysis methods
- Describe plans for data management and analysis, curating, and sharing
- Describe plan for disseminating findings

**For studies that include hypothesis testing:**

- Identify the minimum relevant mean differences or relationship between variables and sample size required to ensure adequate statistical power to detect true differences or relationships of this magnitude or larger

**For qualitative studies:**

- Justify the sample size and selection plan

**For studies analyzing secondary data:**

- Describe the source and availability of data and sequence of modeling planned

↑ OVERVIEW

→ CHECKLISTS

www.evalu-ate.org/webinars/2014\_dec/





Research  
vs.  
Evaluation  
in ATE

Kirk

## Key Questions



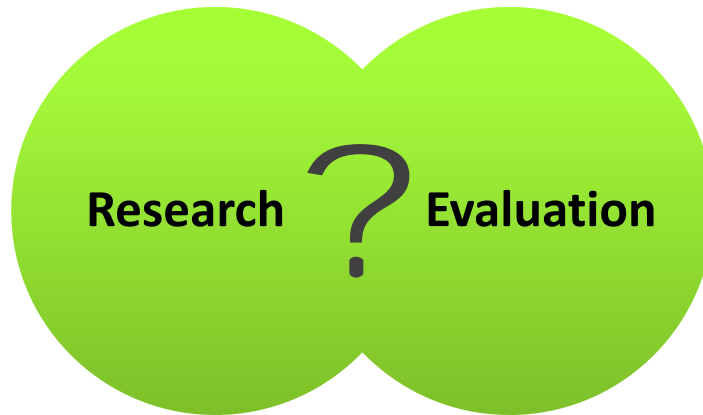
Kirk

- ① How might “**research**” and “**evaluation**” be framed by concepts relating to the Common Guidelines?
- ② How might the above question bear on ATE projects and similar NSF-supported work?
- ③ Why should you care about this?

**The Problem:**  
*The “NSF Conundrum”*



Kirk



**The Problem:**  
*The “NSF Conundrum”*



Kirk

Principal investigators focused on delivery of  
program activities



## The Problem: *The “NSF Conundrum”*



Kirk

External evaluators often became de facto researchers, testing the PI’s innovation



## One Response: A Trend for Federal Funding



Kirk



### Innovation

The Guidelines reframe our work as development of STEM education innovations



### Broader Impacts


Innovations should be conceived, improved, and adopted to achieve lasting education outcomes for stakeholders



### Intellectual Merit

Learning from such work should advance broader understandings about teaching and learning


## Research vs. Evaluation



Kirk

Research & Development	Program Evaluation
<p>Reframed as <b>Research &amp; Development (R&amp;D)</b></p>	<p>Reframed as <b>Program Evaluation</b></p>
<p>Structured study of the <b>innovation</b> in terms of its promise of effectiveness</p>	<p>Study of implementation and impact of the <b>project's R&amp;D</b> activities</p>
<p>Internal to the project, working with developers</p>	<p>External to the project, third-party perspective</p>

## Research vs. Evaluation



Kirk

Research & Development	Purposes
<ul style="list-style-type: none"><li>• Foundational</li><li>• Early-Stage/Exploratory</li><li>• Design and Development</li><li>• Efficacy</li><li>• Effectiveness</li><li>• Scale-up</li></ul>	<ol style="list-style-type: none"><li>1. Iteratively improve the innovation in question; inform development</li><li>2. Advance broader understandings about education</li></ol>

(IES & NSF, 2013)

**Evaluation** – Are **purposes** being achieved, and how well...?

## Research vs. Evaluation



Kirk

### Research & Development

- Foundational
- Early-Stage/Exploratory
- Design and Development
- Efficacy
- Effectiveness
- Scale-up

(IES & NSF, 2013)

### Program Evaluation

Review panels or boards  
Third-party evaluator

- Implementation-Impact
- Process-Product
- Monitoring
- Performance Reporting

*Examines both **research**  
and **development!***

## Research in the ATE Program

*Your Reality – Still early days for the  
Common Guidelines in the ATE program*



Kirk

<b>ATE Projects</b>	Lots of variety; some require program evaluation but some are clearly R&D (e.g., Curriculum & Materials Development)
<b>ATE Centers</b>	Not developing models; focus on delivery; require program evaluation
<b>Targeted Research</b>	Invokes the Common Guidelines; describes Planning, Exploratory, and Full Scale R&D projects; <i>alignment with ATE program and priorities is currently being worked out...</i>



**Thank you!**

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Syracuse, NY 13203  
kirk@hezel.com



**ATE Targeted  
Research in  
Technician  
Education**

**Will**

## Targeted Research on Technician Education

### Goals:

- 1) Stimulate and support research on technician education
- 2) Build the partnership capacity between 2- and 4-year institutions to design and conduct research and development

—NSF ATE Program Solicitation



Photo courtesy of atecenters.org

## Research Challenges in the ATE Program



Will



- Conflation of evaluation and research
- Project longevity vs. research interests
- Need for research expertise

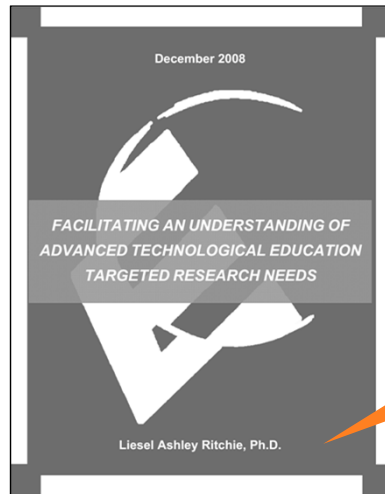
Available from [www.evaluate-ate.org/ate-program-evaluation-research/](http://www.evaluate-ate.org/ate-program-evaluation-research/)



## Conflation of Research and Evaluation



Will



“ATE PIs tend not to distinguish between evaluation and research and use these terms interchangeably.” (p 18)

## Project Longevity v. Research Interests



Will

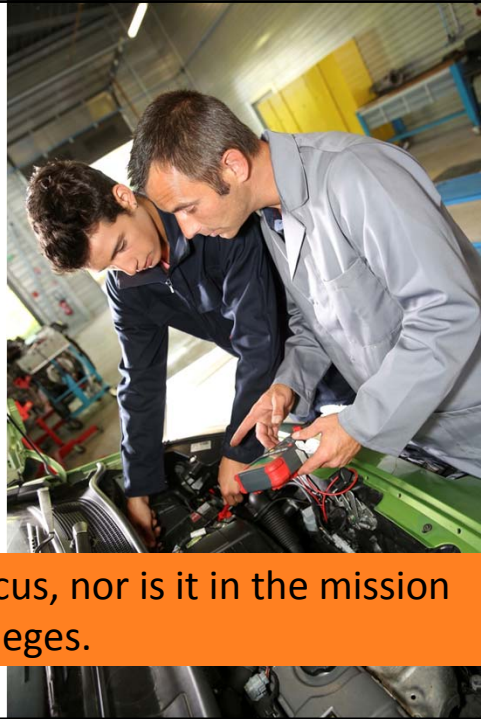
- 3-4 year grants
- Longitudinal studies beyond the funding period are generally not feasible
- Difficult to track community college students particularly after enrollment





## Need for Research Expertise

ATE grants typically led by educators with expertise on program development, curricular development, and professional development within their area of technical expertise.



Research is not their focus, nor is it in the mission of most community colleges.

## Need for Research Expertise



Will

"NSF always wants to know about student outcomes, but we don't really know how to do the research."

"We didn't know there were people like you out there who did this research."



Will Tyson meeting with Eric Roe, Director of the Banner Center for Manufacturing and Applied Technology at Polk State College.

## Need for Research Expertise



Will



There is a large community of social science and education scholars who conduct NSF-funded research in STEM education.

## Need for Research Expertise



Will



Few have experience conducting research on community colleges' STEM pathways or collaborating directly with community colleges.

## Need for Research Expertise



Will



There is a tremendous opportunity for community college-based PIs to develop partnerships with experienced researchers

## Types of ATE-funded Research Projects



Will

<b>Planning</b>	<b>Research and Development</b>	
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<b>Design Research and Pilot Studies</b>	<b>Exploratory</b>	<b>Full-Scale</b>
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\$150,000	\$300,000	\$800,000
2 years	2 years	3 years

“Projects must clearly demonstrate partnerships between faculty at 2-year and 4-year colleges and universities, and the 2-year faculty must have leadership roles on all projects.”

—2014 ATE Program Solicitation

## Connecting 4-years to 2-years



Will

### Roots of PathTech Proposal:

- Reached out to FLATE with a basic idea of a research plan
- Held multiple meetings to learn about FLATE and local ET program concerns and questions
- Developed research questions in response to needs of community college partners

## Connecting 2-years to 4-years



Will

### Identify experienced researchers:

- **Training:** social sciences (i.e., sociology, anthropology, psychology) and/or education
- **Interests:** higher education, STEM education, life course, work and occupations
- **Background:** track record of NSF funding and/or publications

## As an example...

- 10 years of experience as an NSF grantee as post-doc, senior personnel, co-PI, and PI
- Funded by various NSF programs (ROLE, STEP, REESE, ITEST, ADVANCE, ATE)
- Participated in NSF panel and ad-hoc reviews
- Published book on engineering programs

## Becoming an Engineer in Public Universities

Pathways for Women  
and Minorities

*Edited by  
Kathryn M. Borman,  
Will Tyson, and  
Rhoda H. Halperin*

Palgrave Studies in Urban Education



## My ATE Research Project



Will

## PathTech



**Successful Academic and Employment Pathways  
in Advanced Technologies**

NSF #1104214

\$1.2 million over 4 years (2011-15)

[sociology.usf.edu/pathtech](http://sociology.usf.edu/pathtech)

## Project Objectives



Will

- Understanding recruitment and pathways into engineering technology
- Providing information to improve ET education
- Increasing the visibility of ET programs
- Providing information to help meet workforce demands

## Partners



Will



Advanced  
Manufacturing



Biomedical Systems,  
Quality, Digital Design  
& Modeling



Advanced  
Manufacturing



Electronics, Digital  
Design & Modeling

Partnerships with ET programs connect researchers with:  
ET students | High schools ET Programs | Industry partners

## Community Engagement



Will



Will Tyson, FLATE Director Marilyn Barger, PathTech team member Rebekah Heppner touring Draper Labs (St. Petersburg) during May 2013 FLATE Industry Advisory Council meeting

Will Tyson presenting at Fall 2013 Florida Forum on Engineering Technology

## Developing Partnerships: PathTech Model



Will



- Interdisciplinary frameworks and multiple methodologies
- Collecting and analyzing data from various sources and multiple structural levels
- Collaboration with FLATE and shared partnership with schools, industry, and communities
- Research moves beyond employability skills instruction and academia and into classrooms, boardrooms, and local, state, and national policy



## Pathways Research

Individuals transitioning from school to work often simultaneously experience other life transitions as well.

Social class, race/ethnicity, gender, geography, and societal norms influence expectations for educational and occupational attainment.



## Methodology



Will

### Interviews

- High School Students (70)
- High School Teachers and Administrators (6)
- Community College Students (67)
- Community College ET Faculty and Administrators (4)
- Industry Partners (27)
  
- Interviews were approximately 20-30 minutes
- Transcripts coded and thematically analyzed



## Interview Topics



Will

### High school students

- What prompted their interest in pursuing advanced technology education
- Coursework
- Future plans

### Community college ET students

- How they came to learn about ET programs
- Factors that influenced their decision to enroll in an ET program
- High school preparation
- Perceptions of the ET job market

### Industry

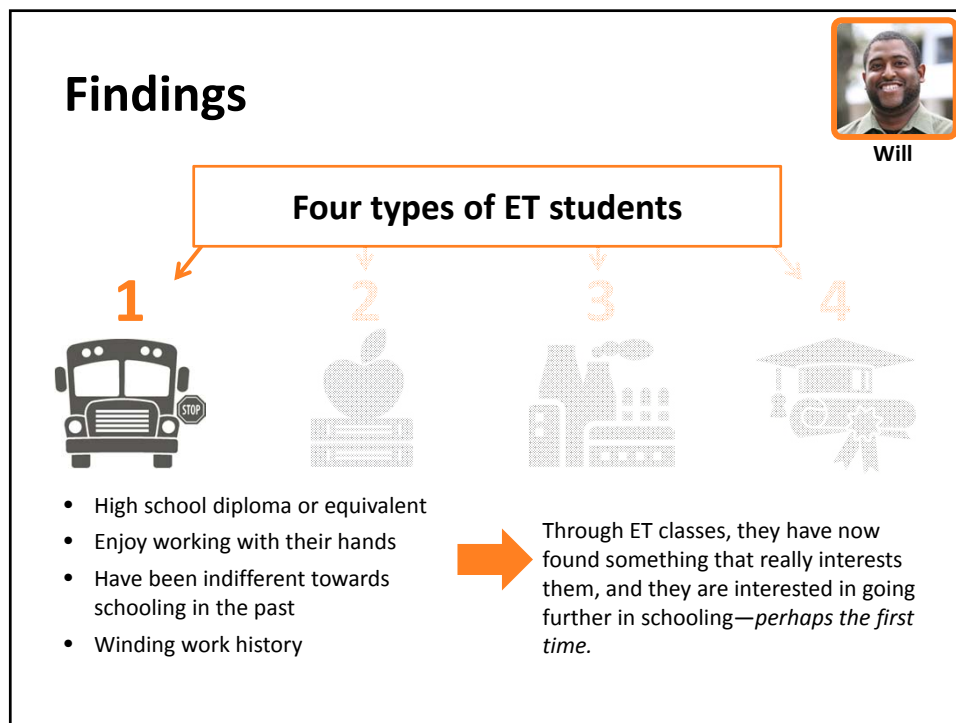
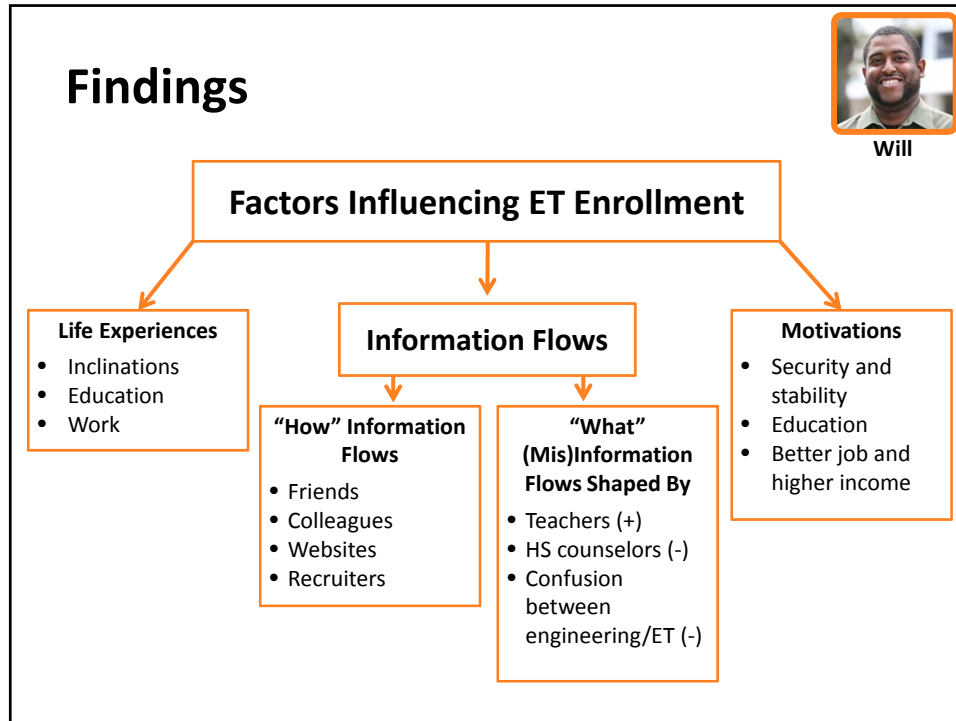
- Level of preparation in local workforce
- How they recruit workers
- Characteristics of the idea worker
- Future of local ET workforce

## Brief Overview of Results from Community College Interviews




Will

- Factors Influencing ET Enrollment
- Four Types of ET Students
- Pipeline vs. Cycling
- Emerging Pathways




## Findings



Will

**Four types of ET students**


1 2 3 4



- At least a high school diploma and often some college.
- Describe themselves as good students in the past, but never exposed to ET in their earlier educational or work experiences.
- Stable work history

➔ Aim to enter industry with the credentials/certifications from their ET programs


## Findings



Will

**Four types of ET students**


1 2 3 4



- Focused on re-skilling
- Eager to improve their job
- Prior careers in manufacturing or related fields; laid off after many years of employment

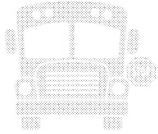
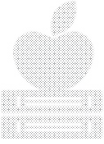


➔ Taking ET courses and seeking certification in order to gain a new and more stable job that will be able to support their families.

## Findings



Will


**Four types of ET students**

- 1 
- 2 
- 3 
- 4 

- Degree-seeking
- Hope to empower themselves and gain the respect of others





➔ Higher education degree has often been a life-long dream, and ET provides a pathway

## Findings




Will

**Four types of ET students**

- 1 
- 2 
- 3 
- 4 


**Overall, ET community college programs have a transformative effect on students**

## 'Pipeline' or 'Cycling'?

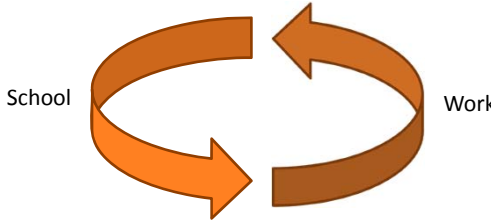


**Will**


**Pipeline:** Linear progression from school to work



**Cycling:** Non-linear, multiple life transitions



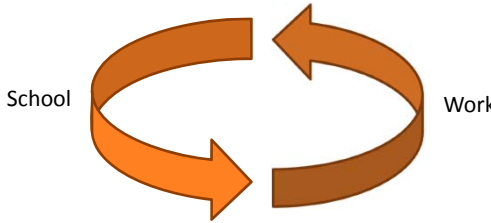
## 'Pipeline' or 'Cycling'?



**Will**

**Cycling**

- Fluid system of transitions between school, work, and family
- Community college is not just a destination with a simple entrance and exit
- Pathways between school and work are necessitated by broader market demands and personal life histories



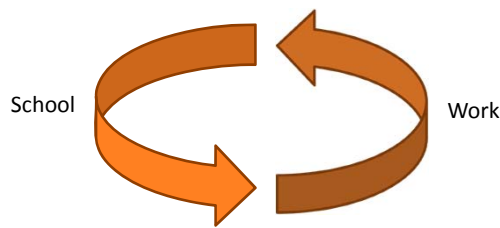
## Cycling in Order to Re-Skill



Will

### Reskilling

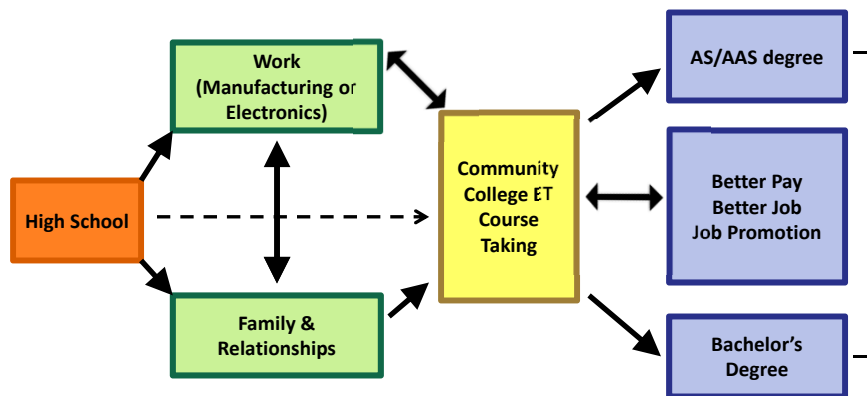
necessary for survival in the current economy and its demands for a highly skilled workforce



## Emerging Pathways



Will



## Transitioning ATE Projects into Targeted Research (Examples)



Will

- Develop ATE project proposal with small research study, such as a survey or add a small study to an existing project
- Conduct research early in Years 1, 2, and 3 to track trends and any changes in student outcomes
- At the end of Year 2, partner to seek funding for a Targeted Research project to understand long-term impact of the original project
- Use existing small study as a pilot for broader targeted research plan



**Thank you!**

Will Tyson  
Associate Professor  
Department of Sociology  
University of South Florida

Principal Investigator,  
PathTech  
NSF #1104214