

Common Guidelines for Education Research and Development

Implications for Research Design and Evaluation in ITEST



Edith Gummer



NSF-ED Joint Committee

The Joint Committee began meeting in January 2011 with representatives from both agencies.

Co-Chairs:

Janice Earle, NSF (EHR) and Rebecca Maynard, ED (Institute of Education Sciences, 2011-2012; Ruth Curran Neild, ED (Institute of Education Sciences, 2012-2013)

Ex Officio:

Joan Ferrini-Mundy Assistant Director, NSF (EHR) and John Easton, Director, Institute of Education Sciences

Members:

- ▶ **ED:** Elizabeth Albro, Joy Lesnick, Ruth Curran Neild, Lynn Okagaki, Anne Ricciuti, Tracy Rimdzius, Allen Ruby, Deborah Speece (IES); Karen Cator, Office of Education Technology; Michael Lach, Office of the Secretary; Jefferson Pestronk, Office of Innovation and Improvement
- ▶ **NSF:** Jinfa Cai, Gavin Fulmer, Edith Gummer (EHR-DRL); Jim Hamos (EHR-DUE); Janet Kolodner (CISE and EHR-DRL); Susan Winter (SBE)

What do we mean by “Common Guidelines?”

A cross-agency framework that describes:

- ▶ Broad types of research and development
- ▶ The expected *purposes, justifications, and contributions* of various types of research to knowledge generation about interventions and strategies for improving learning

Knowledge Development in Education

- ▶ Is not strictly linear; three categories of educational research – core knowledge building, design & development, and studies of impact – overlap
- ▶ Requires efforts of researchers and practitioners representing a range of disciplines and methodological expertise
- ▶ May require more studies for basic exploration and design than for testing the effectiveness of a fully-developed intervention or strategy
- ▶ Requires assessment of implementation—not just estimation of impacts
- ▶ Includes attention to learning in multiple settings (formal and informal)



ITEST and Research – Then and Now

- ▶ NSF 07-514 – Information Technology Experiences for Students and Teachers
 - ITEST is designed to increase the opportunities for students and teachers to learn about, experience, and use information technologies within the context of science, technology, engineering, and mathematics (STEM), including Information Technology (IT) courses. It is in direct response to the concern about shortages of information technology workers in the United States.

ITEST and Research – Then and Now

- ▶ NSF 07-514 – Information Technology Experiences for Students and Teachers
 -(the) ITEST program will not only increase interest in IT through the creation of effective student education programs in both school and non-school contexts, but also maintain interest through supportive activities that include parental involvement, career exploration, externships, [research](#), and multi-year programs

ITEST and Research – Then and Now

- ▶ NSF 07-514 – Information Technology Experiences for Students and Teachers
 -The Resource Center should also provide a comprehensive evaluative **research** plan that includes the collection and analysis of data on program effectiveness
 -Projects should build on lessons learned from prior efforts and the educational **research** literature

ITEST and Research – Then and Now

- ▶ NSF 07-514 – Information Technology Experiences for Students and Teachers
 -These organizations already provide creative examples of IT applications in exhibitions, programs, **research**, and administration
 - Each project is required to support the evaluative **research** on the impact of the ITEST program that will be conducted by the ITEST Resource Center

ITEST and Research – Then and Now

- ▶ NSF 08-514 – **Innovative** Technology Experiences for Students and Teachers
 -meet the demand for qualified STEM, including information technology workers; to diversify the workforce since women and minorities are underrepresented in Information and Communication Technology(ICT) and other STEM fields; and to produce **research** addressing STEM workforce issues.

ITEST and Research – Then and Now

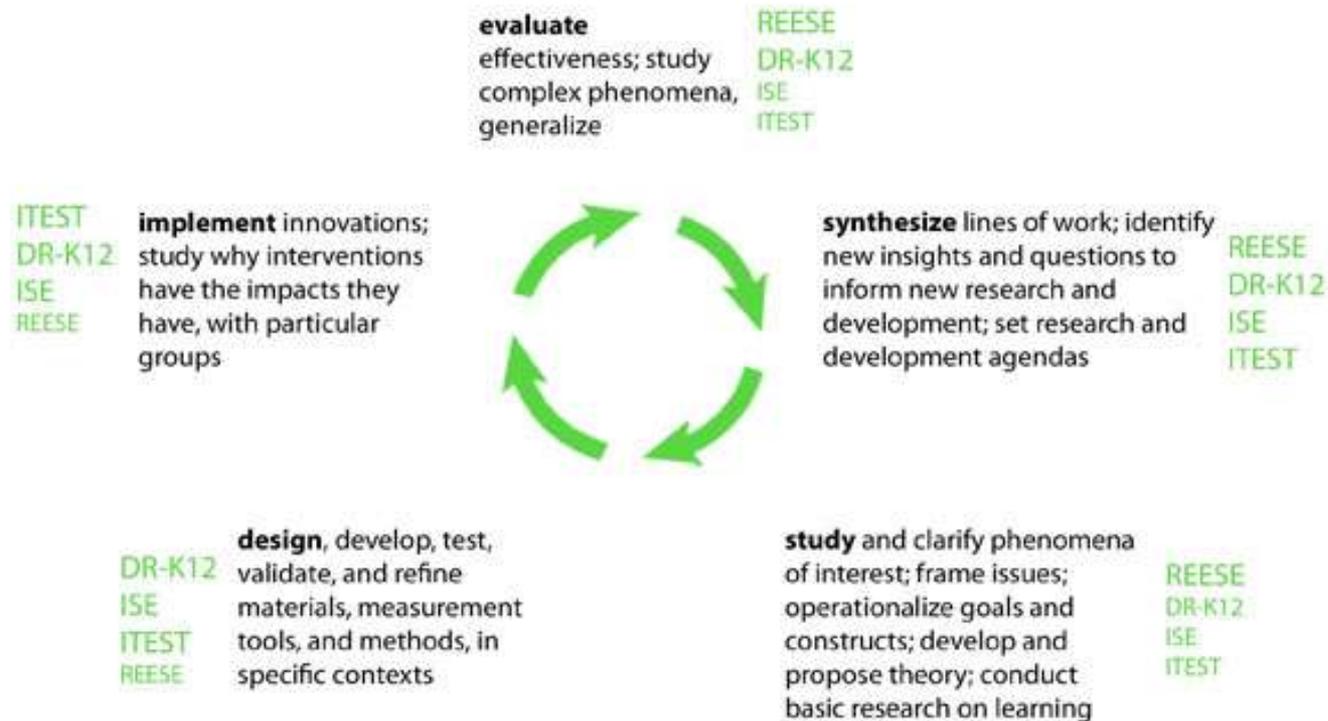


Figure 1. **DRL Cycle of Innovation and Learning**
 (Note: Programs whose primary emphases relate to particular components appear in larger type.)

ITEST and Research – Then and Now

- ▶ NSF 08–514 – Innovative Technology Experiences for Students and Teachers
 - **Studies** projects will be **research** projects to enrich understanding of issues related to enlarging the STEM workforce, including efficacy and effectiveness studies of intervention models, longitudinal studies of efforts to engage students in the STEM, or especially ICT, areas, development of instruments to reliably and validly assess engagement, persistence, and other relevant constructs, or studies to identify predictors of student inclination to pursue STEM and/or ICT career trajectories.
 - “What will ensure that the nation has the capacity it needs to participate in transformative, innovative STEM advances?”
 - How can we assess and predict inclination to participate in the STEM fields, and how can we measure and study impact of various models to encourage that participation?”

ITEST and Research – Then and Now

- ▶ NSF 14-512 – Innovative Technology Experiences for Students and Teachers
 - The ITEST program through **research** and model-building activities seeks to build understandings of best practice factors, contexts and processes contributing to K-12 students' motivation and participation.....
 - The ITEST program funds **foundational and applied research** projects addressing the development, implementation, and dissemination of innovative strategies, tools, and models for engaging students.....

ITEST and Evaluation – Then and Now

- ▶ NSF 07-514
 - *Evaluation Plan*. The proposal must include plans for formative and summative evaluation of the project to assess the impact of the project's activities, progress, and success in meeting goals

ITEST and Evaluation – Then and Now

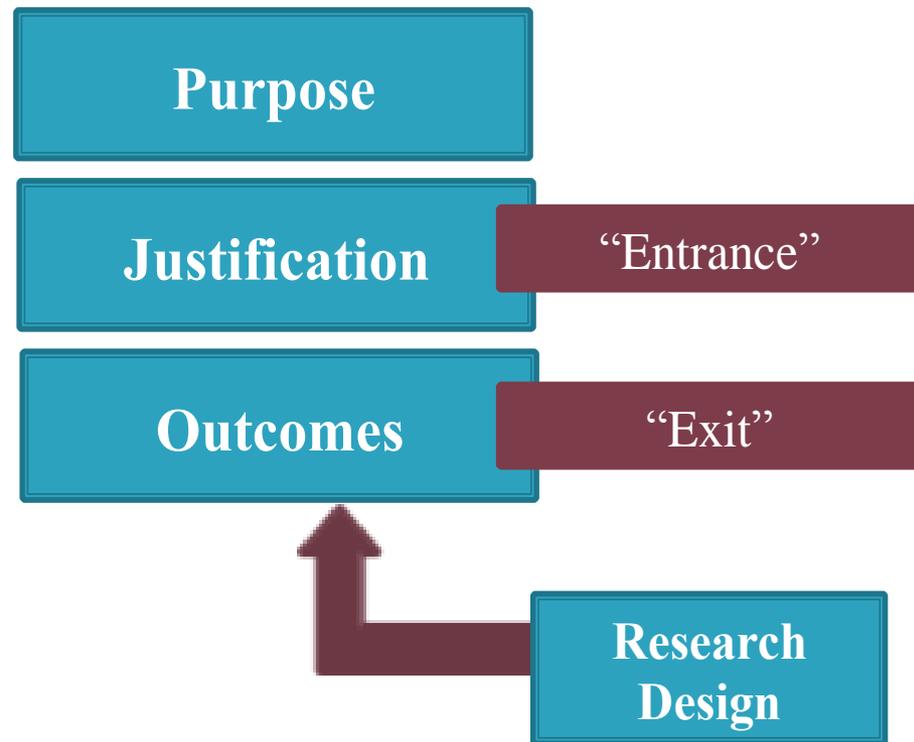
- ▶ NSF 14-512
 - **Evaluation or External Review:** All DRL projects are subject to a series of external, critical reviews of their designs and activities (including their theoretical frameworks, any data collection plans, analysis plans, and reporting plans). A proposal must describe appropriate project-specific external review and feedback processes. These might include an external review panel or advisory board proposed by the project or a third-party evaluator.

Research Design and Evaluation in ITEST

- ▶ Foundational
- ▶ Early Stage or Exploratory
- ▶ Design and Development
- ▶ Impact Studies
 - Efficacy
 - Effectiveness
 - Scale-up

Research Design and Evaluation in ITEST

All six types of research listed in the Common Guidelines are characterized by the same components



Or....Design Research and Evaluation in ITEST

- ▶ What does changing the focus from Research Design and Evaluation to thinking about the characteristics of Design Research and Evaluation do for the way that we characterize the work of ITEST projects and the program?

Foundational Research

- Fundamental knowledge that may contribute to improved learning & other education outcomes
- ▶ Studies of this type:
 - Test, develop or refine theories of teaching or learning
 - May develop innovations in methodologies and/or technologies that influence & inform research & development in
 - different contexts



Early-Stage or Exploratory Research

- ▶ Examines relationships among important constructs in education and learning
- ▶ Goal is to establish logical connections that may form the basis for future interventions or strategies intended to improve education outcomes
- ▶ Connections are usually correlational rather than causal



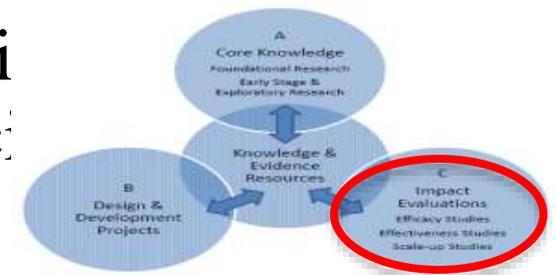
Design and Development Research

- ▶ Draws on existing theory & evidence to design and iteratively develop interventions or strategies
 - Includes testing individual components to provide feedback in the development process
- ▶ Could lead to additional work to better understand the foundational theory behind the results
- ▶ Could indicate that the intervention or strategy is sufficiently promising to warrant more advanced



Studies of Impact

- ▶ Generate reliable estimates of the ability of a fully-developed intervention or strategy to achieve its intended outcomes
- ▶ **Efficacy Research** tests impact under “ideal” conditions
- ▶ **Effectiveness Research** tests impact under circumstances that would typically prevail in the target context
- ▶ **Scale-Up Research** examines effecti range of populations, contexts, and c



Important Features of Each Type of Research

Purpose

How does this type of research contribute to the evidence base?

Justification

How should policy and practical significance be demonstrated?

What types of theoretical and/or empirical arguments should be made for conducting this study?

(continued)

Important Features of Each Type of Research

Outcomes

Generally speaking, what types of outcomes (theory and empirical evidence) should the project produce?

Research Plan

What are the key features of a research design for this type of study?

Important Features... *(continued)*

External Feedback Plan

Series of external, critical reviews of project design and activities

Review activities may entail peer review of proposed project, external review panels or advisory boards, a third party evaluator, or peer review of publications

External review should be sufficiently independent and rigorous to influence and improve quality

Comparisons & Sticking Points - Purpose

Exploratory/ Early Stage	Design & Development	Impact	
		Efficacy	Effectiveness
Investigate approaches, develop theory of action, establish associations, identify factors, develop opportunities	Develop new or improved intervention or strategy <ul style="list-style-type: none"> • Develop solution • Create measures of implementation • Collect data on feasibility • Conduct pilot study 	Impact = improvement of X under ideal conditions with potential involvement of developer	Impact = improvement of X under conditions of routine practice

Comparisons & Sticking Points - Justification

Exploratory/ Early Stage	Design & Development	Impact	
		Efficacy	Effectiveness
Practical education problem, Generate knowledge to inform improvement, Strong theoretical and empirical rationale, Rationale about why Exploratory	Practical, important problem, Different from current practice, Strong theoretical and empirical rationale, Potential to generate important knowledge Theory of action/logic model	Practical problem Important Different from current practice Why & how intervention or strategy improves outcomes	

Comparisons & Sticking Points –Outcomes

Exploratory/ Early Stage	Design & Development	Impact	
		Efficacy	Effectiveness
<p>Empirical evidence of malleable factors</p> <p>Well-specified conceptual framework</p> <p>Determination of basis to pursue additional R & D</p>	<ul style="list-style-type: none"> • Fully developed version • Theory of action • Description of design iterations • Evidence from design testing • Measures with technical quality • Pilot data on promise 	<p>What Works Clearinghouse guidelines on evidence of</p> <ul style="list-style-type: none"> • Study goals • Design and implementation • Data collection and quality • Analysis and findings <p>Documentation of implementation of intervention and counterfactual condition</p> <p>Findings and adjustments of theory of action</p> <p>Key features of implementation</p>	

Comparisons & Sticking Points –Design

Exploratory/ Early Stage	Design & Development	Impact	
		Efficacy	Effectiveness
<ul style="list-style-type: none"> • Set of hypotheses or research questions, • Detailed plan, • Justification for context/sample, • Data sources • Instruments w/ validity & reliability • Opportunities, • Analysis procedures 	Methods for <ul style="list-style-type: none"> • Developing intervention or strategy • Collecting evidence of feasibility of implementation • Obtaining pilot data on promise 	<ul style="list-style-type: none"> • Study design to estimate causal impact • Key outcomes and minimum size of impact for relevance • Study settings & target population(s) • Sample with power analysis • Data collection plan* • Analysis and reporting plan 	

* procedures, measures with strategies to ensure technical quality, implementation, comparison group practices, study context.

Questions?

Common Guidelines for Education Research and Development:

http://www.nsf.gov/pubs/2013/nsf13126/nsf13126.pdf?WT.mc_id=USNSF_124

FAQ's for Common guidelines

<http://www.nsf.gov/pubs/2013/nsf13127/nsf13127.pdf>

Edith Gummer

egummer@nsf.gov