

# Common Guidelines for Education Research and Development

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A Report from the Institute of Education Sciences,  
U.S. Department of Education

and the National Science Foundation

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## Preface

In January 2011, a Joint Committee of representatives from the U.S. Department of Education (ED) and the U.S. National Science Foundation (NSF) began work to establish cross-agency guidelines for improving the quality, coherence, and pace of knowledge development in science, technology, engineering and mathematics (STEM) education. The committee formed to enhance the efficiency and effectiveness of both agencies' STEM education research and development programs in response to recommendations from the Office of Science and Technology Policy (OSTP) and guidance from the Office of Management and Budget (OMB) (Zients, 2012). Although the starting place for the committee was research in STEM, ED quickly realized the broader applicability of the guidelines to other content areas in which it funds research and development.

Education research and development programs at NSF are distributed throughout its science and engineering directorates but are located primarily in its Directorate for Education and Human Resources (EHR). EHR's purview includes K-12 education, postsecondary education, and after-school and informal learning environments, as well as the study of science and engineering innovations that emerge from other directorates. ED's research, development, and evaluation programs are located primarily in the Institute of Education Sciences (IES) but also are represented in the Policy and Program Studies Service (PPSS), the Office of Innovation and Improvement (OII), and the National Institute on Disability and Rehabilitation Research (NIDRR).

The Joint Committee examined whether the agencies' expectations for the research studies they fund could be characterized in such a way as to provide cross-agency guidance for program officers, prospective grantees, and peer reviewers. A first task was to define the types of ED- and NSF-funded research that relate to the development and testing of interventions and strategies designed to increase learning. Types of research range from early knowledge-generating projects to studies of full-scale implementation of programs, policies, or practices. Importantly, the committee sought to create a common vocabulary to describe the critical features of these study types to improve communication within and across the agencies and in the broader education research community.

Second, the Joint Committee specified how the types of research relate to one another and described the theoretical and empirical basis needed to justify each research type. The committee emphasizes the importance of proposed studies building on and referencing an evidence base and, in turn, contributing to the accumulation of empirical evidence and development of theoretical models. Throughout its work, the Joint Committee generally adhered to the guiding principles identified in *Scientific Research in Education* (National Research Council, 2002), which call for research that:

- poses significant questions that can be investigated empirically;
- links empirical research to relevant theory;
- uses research designs and methods that permit direct investigation of the question;
- is guided by a coherent and explicit chain of reasoning;
- replicates and generalizes across studies; and
- attends to contextual factors.

Through this document, the Joint Committee seeks to provide a broad framework that clarifies research types and provides basic guidance about the purpose, justification, design features, and expected outcomes from various research types. In that spirit, the Joint Committee intends this to be a "living document" that may be adapted by agencies or divisions within agencies in response to

their needs and opportunities. Over time, the framework may be elaborated or rearranged according to agency focus and assessments of the needs of education researchers and practitioners.

The draft guidelines were distributed throughout ED and NSF for review and comment. NSF held several sessions for agency staff to provide comments and feedback. The agencies jointly sought feedback from the research community at the 2013 annual meetings of the American Educational Research Association, where representatives from ED and NSF presented the guidelines and held small discussion groups. ED and NSF representatives also presented the guidelines at a meeting of Federal evaluators hosted by the Office of Management and Budget (OMB). Finally, NSF leadership reviewed and commented on the document, and detailed reviews of the document by education research experts were obtained through the Institute of Education Sciences' Standards and Review Office.

## Members of the Joint Committee

Janice Earle, Co-Chair  
Directorate for Education and Human Resources, National Science Foundation

Rebecca Maynard, Co-Chair (2011-2012)  
Ruth Curran Neild, Co-Chair (2012-2013)  
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John Q. Easton,  
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## Introduction

*At its core, scientific inquiry is the same in all fields. Scientific research, whether in education, physics, anthropology, molecular biology, or economics, is a continual process of rigorous reasoning supported by a dynamic interplay among methods, theories, and findings. It builds understanding in the form of models or theories that can be tested.*

***Scientific Research in Education***  
National Research Council, 2002

Each year, the National Science Foundation (NSF) and the U.S. Department of Education (ED) make substantial investments in education research and development. Through these efforts, the agencies seek to improve opportunities to learn science, mathematics, engineering, and technology (STEM) and to increase student achievement, engagement and persistence in those areas. ED also supports research and evaluation in a range of areas other than STEM.

Though complementary, the agencies' focus areas in education research differ in ways that correspond to their respective roles in government and society. NSF, which is charged with increasing the quality and amount of science and engineering research in a variety of contexts, has emphasized basic research on STEM learning, cognition, and development of instructional approaches, technologies, and materials in both formal and informal settings. In contrast, ED concentrates its investments on developing and testing the effectiveness of well-defined curricula, programs, and practices that could be implemented by schools. The complementary missions of the agencies, along with the continuing urgency of improving American students' STEM knowledge and skills, form the backdrop for the evidence guidelines and study types described in this document.

This document describes NSF and ED's shared understandings of the roles of various types or "genres" of research in generating evidence about strategies and interventions for increasing student learning. These research types range from studies that generate the most fundamental understandings related to education and learning (for example, about brain activity), to research that examines associations between variables, iteratively designs and tests components of a strategy or intervention, or is designed to assess impact of a fully-developed intervention on an education-related outcome. More specifically, the document describes the agencies' expectations for the purpose of each type of research, the empirical and/or theoretical justifications for different types of studies, types of project outcomes, and quality of evidence.

Fundamentally, these shared, cross-agency expectations are intended to (1) help organize and guide NSF's and ED's respective decisions about investments in education research and (2) clarify for potential grantees and peer reviewers the justifications for and evidence expected from each type of study, as well as relevant aspects of research design that would contribute to high-quality evidence. The primary audiences for this document are agency personnel, scientific investigators who seek funding from these agencies for education research projects, and those who serve as peer reviewers of proposals for scientific research.

By delineating common expectations for study characteristics, it is hoped that each agency will be better able to build on the investments of the other and to see its own investments reap greater

return in improved and tested education practices and policy. And by clarifying the products that should result from different types of studies, the agencies hope to speed the pace of research and development in education—including obtaining meaningful findings and actionable results—through a more systematic development of knowledge (Shonkoff, 2012).

For example, a project that involves design and development of an intervention or strategy should, at its conclusion, have generated a theory of action, a set of intervention components, and preliminary evidence regarding promise for improving education outcomes. In combination, these products from design and development research would make the case that an efficacy trial of a strategy or intervention is warranted, assuming positive and substantively important impacts (see Table 3 for a full set of project outcomes). Without attention to each of these project outcomes, which serve as justification for potentially more-costly and wider-scale testing, the full evidentiary potential of an investment in design and development may not be realized. Likewise, a well-conducted study of impacts should include hypothesis-generating exploratory analyses that can inform additional work. Research on implementation, adaptation, and adoption is an important part of all research endeavors.

Ultimately, these expectations should advance knowledge by asking neither too little nor too much of proposed studies. Too little can be asked of a study when it is not adequately justified or carefully designed to generate good evidence. Too much can be asked when the role of a particular kind of study in evidence generation is unclear. For example, a project about design and development of an intervention should not be required to provide strong evidence of effectiveness among a wide range of populations. If an opportunity for such integration of research purposes occurs, it may be advisable to pursue; however, it also is acceptable for a design and development project to stop short of conducting an efficacy study.

## A Cross-Agency Project

This document resulted from collaborations between representatives from the National Science Foundation (NSF) and the U.S. Department of Education (ED) to identify the spectrum of study types that contribute to development and testing of interventions and strategies, and to specify expectations for the contributions of each type of study. This collaboration is but one example of increasing use of evidence government wide to support decision making about investments in programs and research. Although NSF and ED focused on increasing knowledge related to learning in STEM, the general approach described in this document applies to knowledge generation in other areas of education research.

## Types of Research

Most simply, the six types of research described in this document form a “pipeline” of evidence that begins with basic and exploratory research, moves to design and development of interventions or strategies, and, for interventions or strategies with initial promise, results in examination of the effectiveness for improving learning or another related education outcome. However, as we describe later in this document, the reality of scientific investigation is more complicated, less orderly, and less linear than such a “pipeline” suggests. In addition, these research types do not represent the entire panoply of useful investigations in education, nor does this document describe the full range of purposes for which a given type of research is useful.



Below, we provide a basic description of the purpose of each of the six types of research. The research types are described in more detail in Tables 1-4.

**Foundational Research and Early-Stage or Exploratory Research** contributes to *core knowledge* in education. *Core knowledge* includes basic understandings of teaching and learning, such as cognition; components and processes involved in learning and instruction; the operation of education systems; and models of systems and processes.

- **Research Type #1: Foundational Research** provides the fundamental knowledge that may contribute to improved learning and other relevant education outcomes. Studies of this type seek to test, develop, or refine theories of teaching or learning and may develop innovations in methodologies and/or technologies that will influence and inform research and development in different contexts.
- **Research Type #2: Early-Stage or Exploratory Research** examines relationships among important constructs in education and learning to establish logical connections that may form the basis for future interventions or strategies to improve education outcomes. These connections are usually correlational rather than causal.

**Design and Development Research (Research Type #3)** develops solutions to achieve a goal related to education or learning, such as improving student engagement or mastery of a set of skills. Research projects of this type draw on existing theory and evidence to design and iteratively develop interventions or strategies, including testing individual components to provide feedback in the development process. These projects may include pilot tests of fully developed interventions to determine whether they achieve their intended outcomes under various conditions. Results from these studies could lead to additional work to better understand the foundational theory behind the results or could indicate that the intervention or strategy is sufficiently promising to warrant more-advanced testing.

**Efficacy, Effectiveness, and Scale-up Research** contributes to evidence of impact, generating reliable estimates of the ability of a fully-developed intervention or strategy to achieve its intended outcomes. The three types of *Impact Research* share many similarities of approach, including designs that eliminate or reduce bias arising from self-selection into treatment and control conditions, clearly specified outcome measures, adequate statistical power to detect effects, and data on implementation of the intervention or strategy and the counterfactual condition. However, these studies vary with regard to the conditions under which the intervention is implemented and the populations to which the findings generalize. Specifically,

- **Research Type #4: Efficacy Research** allows for testing of a strategy or intervention under “ideal” circumstances, including with a higher level of support or developer involvement than would be the case under normal circumstances. Efficacy Research studies may choose to limit the investigation to a single population of interest.
- **Research Type #5: Effectiveness Research** examines effectiveness of a strategy or intervention under circumstances that would typically prevail in the target context. The importance of “typical” circumstances means that there should not be more substantial developer support than in normal implementation, and there should not be substantial developer involvement in the evaluation of the strategy or intervention.
- **Research Type #6: Scale-up Research** examines effectiveness in a wide range of populations, contexts, and circumstances, without substantial developer involvement in implementation or evaluation. As with Effectiveness Research, Scale-up Research should be

carried out with no more developer involvement than what would be expected under typical implementation.

For each of these research types, the Joint Committee has characterized

- the **purpose**, or how the type of research contributes to the evidence base (Tables 1 and 2);
- the **theoretical and empirical justifications** required for conducting this type of research (Table 3);
- **expectations for research design and expected products** of the research, such as exploratory analysis, impact estimates, or a well-elaborated theory of action (Table 4); and
- **expectations for review** of the products from each type of research (Table 5).

## Knowledge Generation and the Complex Connections among Research Types

Although the six study types follow a logical sequence of development of basic knowledge, design, and testing, the Joint Committee emphasizes the reality of building knowledge is considerably more complex. Specifically, it assumes the following:

***Knowledge development is not linear.*** The current of understanding does not flow only in one direction (that is, from basic research to studies of effectiveness). Rather, research generates important feedback loops, with each type of research potentially contributing to an evidence base that can inform and provide justification for other types of research. For example, just as Foundational Research can contribute to a justification for an Impact Research, so can the findings from Impact Research identify needs for more fundamental exploration.

***Investigation can sometimes move directly from development of core knowledge to Scale-up Research.*** New learning opportunities and technologies—Massive Open Online Courses (MOOCs), for example—make it possible to quickly test learning innovations at scale without prior small-scale testing.

***Individual studies may incorporate elements that cut across research types.*** For example, a Design and Development Research project may incorporate a small-scale study to assess efficacy. Likewise, researchers conducting Efficacy Research may need to engage in design and development cycles, and studies of foundational theories of learning may incorporate both elements.

The Joint Committee makes no assumption about the number of studies that will be conducted to address a given education research problem. Sometimes large numbers of Foundational, Early-Stage or Exploratory, or Design and Development studies may be required to develop a strategy or intervention that is ready for wider-scale examination of impact.

## Introduction to Tables

The following tables represent the various types of education research studies that were identified, along with how each type might address the following characteristics:

1. Purpose of Foundational, Early-Stage or Exploratory, and Design and Development Research Studies
2. Purpose of Studies that Assess the Impact of Education Interventions and Strategies
3. Justification Guidelines
4. Guidelines for Evidence to Be Produced by Studies
5. Guidelines for External Feedback Plans

In Appendix B, the same information is presented in a different format. Appendix B contains information organized by type rather than characteristics.

**Table 1: Purpose of Foundational, Early-Stage or Exploratory, and Design and Development Research Studies**

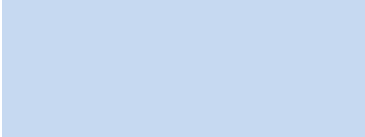
<b>Foundational, Early-Stage or Exploratory, and Design and Development Studies</b>	
<p>An important genre of education research advances knowledge about fundamental principles of sound education practice. This includes studies to advance foundational knowledge that guides theory development; Early-Stage or Exploratory research to identify evidence of the promise (or lack thereof) of programs, policies or practices; and research that guides the development and early-stage testing of innovative programs, policies and practices to improve education outcomes.</p>	
<b>Foundational Research</b>	<p>The purpose of Foundational Research is to advance the frontiers of education and learning; develop and refine theory and methodology; and provide fundamental knowledge about teaching and/or learning.</p> <p>Foundational Research studies may examine phenomena without establishing an explicit link to education outcomes.</p>
<b>Early-Stage or Exploratory Research</b>	<p>The purpose of Early-Stage or Exploratory Research is to investigate approaches to education problems to establish the basis for design and development of new interventions or strategies, and/or to provide evidence for whether an established intervention or strategy is ready to be tested in an efficacy study.</p> <p>Early-Stage or Exploratory Research should establish initial connections to outcomes of interest. Studies in this genre should support the development of a well-explicated theory of action that can inform the development, modification, or evaluation of an intervention or strategy. They should build on existing research and theory to examine issues such as:</p> <p>(1) Associations between (a) education or learning outcomes and (b) malleable factors (that is, factors that are alterable, such as children’s behaviors; technologies; education programs, policies, and practices) and; (2) Factors and conditions that may mediate or moderate the relationship between (a) education or learning outcomes and (b) malleable factors; and (3) Opportunities for new interventions or strategies, and challenges to their adoption, with the goal of informing policy, practice, and future design or development.</p>
<b>Design and Development Research</b>	<p>The purpose of Design and Development Research is to develop new or improved interventions or strategies to achieve well-specified learning goals or objectives, including making refinements on the basis of small-scale testing. Typically this research involves four components:</p> <p>(1) Development of a solution (for example, an instructional approach; design and learning objects, such as museum exhibits or media; or education policy) based on a well-specified theory of action appropriate to a well-defined end user; (2) Creation of measures to</p>

assess the implementation of the solution(s); (3) Collection of data on the feasibility of implementing the solution(s) in typical delivery settings by intended users; and (4) Conducting a pilot study to examine the promise of generating the intended outcomes.

In some cases, funders will expect all four stages to be completed within a single project; in other cases, Design and Development Projects may entail sequential projects.

**Table 2: Purpose of Studies that Assess the Impact of Education Interventions and Strategies**

Studies of Impact	
<p>The purpose of Impact Studies is to generate reliable estimates of the ability of a <i>fully developed</i> intervention or strategy to achieve its intended outcomes. For an impact study to be warranted, the theory of action must be well established and the components of the intervention or strategy well specified.</p> <p>The three types of impact studies—Efficacy, Effectiveness, and Scale-up—differ with regard to the conditions under which the intervention is implemented and the populations to which the findings generalize. In addition, as the research moves from Efficacy to Scale-up, studies should also give greater attention to identifying variation among impacts by subgroup, setting, level of implementation, and other mediators.</p> <p>For all impact studies, descriptive and exploratory analyses should be sufficiently elaborated to determine the extent to which the findings support the underlying theory of action.</p>	
<b>Efficacy Research</b>	<p>The purpose of Efficacy Research is to determine whether an intervention or strategy can improve outcomes under what are sometimes called “ideal” conditions. For example, these conditions may include more implementation support or more highly trained personnel than would be expected under routine practice, or in contexts that include a more homogeneous sample of students, teachers, schools, and/or districts than is typical.</p> <p>Efficacy studies may involve the developer in the implementation of the intervention or strategy; however, the study should include reasonable safeguards for ensuring the objectivity and integrity of the study. Sometimes Efficacy studies are used to replicate previous evaluations of an intervention, but under different conditions (e.g., with a different population or using a variant of the intervention or strategy).</p>
<b>Effectiveness Research</b>	<p>The purpose of Effectiveness Research is to estimate the impacts of an intervention or strategy when implemented under conditions of routine practice. To this end, implementation should be similar to what would occur if a study were not being conducted. An Effectiveness study should be carried out with no more developer involvement than what would be expected under typical implementation.</p>
<b>Scale-up Research</b>	<p>The purpose of Scale-up Research is to estimate the impacts of an intervention or strategy under conditions of routine practice <i>and</i> across a broad spectrum of populations and settings. That is, Scale-Up studies should be conducted in settings and with population groups that are sufficiently diverse to broadly generalize findings.</p>



As with Effectiveness Research, Scale-up Research should be carried out with no more developer involvement than what would be expected under typical implementation.

**Table 3: Justification Guidelines**

<b>Foundational Research</b>	
<b>Policy and/or Practical Significance</b>	The proposed project should address important research problems or questions related to education and learning. Although the project should have clear potential implications for policy and/or practice, a direct relationship to student outcomes is not required.
<b>Theoretical and Empirical Basis</b>	The proposal should outline the theoretical and empirical bases for the project and, if relevant, identify why it is necessary to develop new theory, explore learning constructs, or create more useful conceptual frameworks. The proposal should describe whether and how the project will identify or explore important new constructs in education and learning, extend understanding of current constructs, expand understanding of relationships among the constructs under investigation, and/or extend research methodologies appropriate to advancing the evidence base to support improved policy or practice.
<b>Early-Stage or Exploratory Research</b>	
<b>Policy and/or Practical Significance</b>	The proposal for the project should provide a clear description of the practical education problem or issue that will be the study focus and a compelling rationale for studying the problem. The project should provide a compelling case that the proposed research will generate important knowledge to inform the development, improvement, or evaluation of education programs, policies, or practices.
<b>Theoretical and Empirical Basis</b>	The proposal should detail a strong theoretical and empirical rationale for the project. To the extent possible, an empirical rationale should be included with citations of supporting evidence. When a study of an existing intervention or strategy is proposed, there should be a compelling explanation of why this intervention should be studied through Early-Stage or Exploratory Research rather than through Efficacy Research.
<b>Design and Development Research</b>	
<b>Policy and/or Practical Significance</b>	The proposal for the project should provide a compelling rationale that (1) specifies the practical problem the proposed intervention intends to address; (2) justifies the importance of the problem; (3) describes how the proposed intervention or strategy differs from existing practice; and (4) explains why the proposed project has the potential to improve learning or education outcomes or increase efficiencies in the education system or institutional setting beyond what current practice provides.
<b>Theoretical and Empirical Basis</b>	<p>The proposal should include a strong theoretical and empirical justification for development of the proposed intervention or strategy. If the theoretical basis rests on evidence related to individual features or components, the proposal should provide a compelling rationale for how combining these features or components into a new intervention is expected to achieve intended outcomes.</p> <p>The proposal should include a description of the initial concept for the</p>



planned investigation, including a well-explicated theory of action or logic model. The concept and logic model should identify key components of the intervention (i.e., the ingredients hypothesized to be critical to achieving the intended results) and should describe their relationships, theoretically, and operationally.

### **Efficacy Research**

#### **Policy and/or Practical Significance**

The project proposal should provide a clear description of the intervention to be tested and a compelling rationale for examining its impact. The rationale should (1) specify the practical problem the intervention is intended to address; (2) justify the importance of the problem; (3) describe how the intervention differs from other approaches to addressing the problem; and (4) explain why and how the intervention will improve education outcomes or increase efficiencies in the education system beyond current practices or interventions.

The proposal should justify the choice to examine the impact of the intervention under ideal implementation conditions with a well-defined sample, rather than under routine practice conditions with a relevant typical sample or under typical implementation conditions with a broad sample. It also should describe the implementation setting(s) and population group(s) relevant to current and prospective policy or practice.

#### **Theoretical and Empirical Basis**

Efficacy Research should be justified by one or more of the following: (1) empirical evidence of the promise of the intervention from a well-designed and implemented pilot study (e.g., a study conducted as part of a design and development project); (2) empirical evidence from at least one well-designed and implemented Early-Stage or Exploratory Research study supporting all the critical links in the intervention's theory of action; (3) evidence the intervention is widely used even though it has not been adequately evaluated to determine its efficacy; or (4) if the intent is to replicate an evaluation of an intervention with a different population, evidence of favorable impacts from a previous well-designed and implemented efficacy study and justification for studying the intervention with the new target population.

### **Effectiveness Research**

#### **Policy and/or Practical Significance**

The proposal for the project should provide a clear description of the intervention to be tested and a compelling rationale for examining its impact. The rationale should (1) specify the practical problem the intervention is intended to address; (2) justify the importance of the problem; (3) describe how the intervention differs from other approaches to addressing the problem; and (4) explain why and how the intervention will improve education outcomes or increase efficiencies in the education system beyond current practices or interventions.

The proposal should justify the choice to examine the impact of the intervention under routine practice conditions with a relevant typical sample, rather than under ideal implementation conditions with a

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