INSTITUTE OF EDUCATION SCIENCES

REQUEST FOR APPLICATIONS

Education Research Grants

CFDA Number: 84.305A

COMPETITION ROUND	JUNE	SEPTEMBER
Letter of Intent Due Date (https://iesreview.ed.gov/)	04/29/2010	07/19/2010
Application Package Available (http://www.grants.gov/)	04/29/2010	07/19/2010
Application Due Date (http://www.grants.gov/)	06/24/2010	09/16/2010

IES 2010 **U.S. Department of Education**

PART I GENERAL OVERVIEW

1. REQUEST FOR APPLICATIONS

In this announcement, the Institute of Education Sciences (Institute) requests applications for research projects that will contribute to its education research programs in Reading and Writing; Mathematics and Science Education; Cognition and Student Learning; Teacher Quality – Reading and Writing; Teacher Quality – Mathematics and Science Education; Social and Behavioral Context for Academic Learning; Education Leadership; Education Policy, Finance, and Systems; Organization and Management of Schools and Districts; Early Learning Programs and Policies; English Learners; Postsecondary Education; Adult Education; and Education Technology. For the FY-2011 competition, the Institute will consider only applications that meet the requirements outlined below under *Part II Research Grant Topics* and *Part III Requirements of the Proposed Research*.

Separate funding announcements are available on the Institute's website that pertain to the other research and research training grant programs funded through the Institute's National Center for Education Research (http://ncer.ed.gov) and to the discretionary grant competitions funded through the Institute's National Center for Special Education Research (http://ncser.ed.gov). An overview of the Institute's research grant programs is available at http://ies.ed.gov/funding/overview.asp

2. OVERVIEW

Through its Education Research grant program, the Institute supports research over a diverse set of education outcomes and for a range of purposes. The outcomes include school readiness, achievement in core academic content (reading, writing, mathematics, science), and behaviors that support learning in academic contexts for students from prekindergarten through high school, as well as high school graduation, access and retention in postsecondary education, and basic reading, writing, and mathematics skills for adults.

The purposes or goals of the research projects are described below. They are designed to span the range from basic translational research to evaluation of the impact of interventions when the interventions are implemented at scale.

Project Goal

Exploration The Institute solicits projects to explore the relations between education outcomes and malleable factors (i.e., factors that can be changed, such as child behaviors, teachers' practices, school management practices, and education policies), as well as mediators or moderators of those relations. Exploring the relations between malleable factors and education outcomes is translational research; it is intended to inform the development of interventions – programs, practices, or policies – that can improve education outcomes. Exploratory research can be used to identify existing practices, programs, or policies that are associated with better education outcomes and that should be evaluated to determine if the identified practices are the actual cause of the better outcomes, as opposed to some other factor that has yet to be uncovered.

Since the Institute established the goal structure, approximately 10 percent of the projects funded through the Education Research grant program have been exploratory projects.[1]

Development The Institute supports projects to develop innovative education interventions

[1]This percentage is based on all grants funded through the Education Research competitions and does not include grants awarded under competitions for which the Institute's research goal structure did not apply (e.g., all grants awarded prior to 2004, all Research & Development Center awards)

and Innovation

– programs, practices, products, policies – or to improve existing education interventions. To develop or improve education interventions requires an iterative process of designing, testing, revising, and testing to produce a product or system that functions in the way that the developer intends for it to function and that can be implemented in actual education delivery settings (e.g., schools). This iterative process, sometimes called a systems-engineering approach, is important for producing interventions that have the potential to be *potent* and *robust*.

Since the Institute established the goal structure for its Education Research grant program, about 50 percent of the funded projects have been development projects.[1]

Efficacy and Replication

The vast majority of the education programs, practices, and policies that are implemented in U.S. schools have never been rigorously evaluated to determine if they are able to improve student learning (or other desired education outcomes) relative to any other education intervention. The Institute funds experimental and quasi-experimental research projects to evaluate the efficacy of newly developed and existing education programs, practices, and policies under limited conditions. Efficacy projects determine whether an intervention can have a positive impact on the outcomes of interest within a narrow or limited set of conditions.

Efficacy projects also provide an estimate of how *potent* the intervention is for producing the desired outcome. By potent, the Institute refers to the strength of the impact of the intervention. For example, suppose a district has students who are two years below grade-level expectations on reading assessments at the beginning of first grade and wants to have all students reading at grade level by the end of fourth grade. The district might look for reading interventions that are potent enough to produce 1.5 years of growth per year in first, second, third, and fourth grades. An extra half year of growth in each year could bring the students who are two years behind in first grade up to grade-level expectations by the end of fourth grade.

The utility of the intervention – the degree to which it is feasible and practical for implementation in schools – is a key aspect of efficacy evaluations. Interventions that are difficult to implement with fidelity under the supported conditions of an efficacy study are unlikely to be implemented well when the intervention is scaled-up.

Since the Institute established the goal structure for its Education Research grant program, about 26 percent of the funded projects have been efficacy and replication projects.[1]

Scale-up Evaluation

If interventions are able to produce positive effects in narrower efficacy evaluations, they may be ready to be evaluated in a scale-up evaluation. Scale-up evaluations determine whether or not an intervention is effective when it is implemented under conditions that would be typical if the district were to implement it on its own (i.e., without special support from the developer or research team) across a variety of conditions (e.g., different student populations, different types of schools). Scale-up evaluations provide an estimate of how *robust* the intervention is. Will it work under a variety of conditions (e.g., with novice teachers, with large or small classes, in well-organized and in poorly organized schools)?

Since the Institute established the goal structure for its Education Research grant program, about 2 percent of the funded projects have been scale-up evaluations.[1]

Measurement Finally, the Institute supports research to develop and validate measurement instruments that are intended for purposes such as screening, progress monitoring, and outcome assessments. Typically, the instruments are ones used by practitioners. However, the Institute recognizes that there are circumstances in which an instrument needs to be developed that will primarily be used by researchers whose translational research will ultimately lead to improvements in education and special education practices. The Institute supports research to develop and validate such measurement instruments.

Since the Institute established the goal structure for its Education Research grant program, about 12 percent of the funded projects have been measurement projects.[1]

The Institute's research programs are intended to cover the range of research, development, and evaluation activities necessary for building a scientific enterprise that can provide solutions to the education problems in our nation. Focusing on only one type of research activity will not produce the results that the nation seeks. We need *innovation and development* because we have not yet solved old problems (e.g., the achievement gap), and we continue to face new problems and opportunities (e.g., integrating new technologies, building on new findings on how students learn, addressing large groups of students new to the United States and moving to communities that have not worked with such students before). Innovation and development can lead to the design of potent and robust interventions that may be effective for improving education outcomes. However, development and innovation cannot stand-alone. On the front end, the work of creating more potent and more robust interventions benefits from exploratory research to uncover underlying processes and identify promising approaches to test. This research, although at times quite basic, is translational research that is intended to inform the development of new and more powerful interventions. On the back end, we need evaluations that test the effect of the interventions on their intended outcomes. Education has always produced new ideas, new innovations, and new approaches, but as in any field, new is not always better. Evaluations can tell us which programs and policies actually produce positive effects on education outcomes, which need more work to become more potent or more robust, and which should be discarded. Only appropriate empirical evaluation can identify those programs that do in fact improve student outcomes.

Finally, the Institute intends for its research programs to contribute to the generation of new knowledge and theories relevant to learning, instruction, and education systems. The goal structure of the Institute's research programs divides the research process into stages. Under the Exploration goal, researchers generate hypotheses about the components and processes involved in learning and instruction and in the operation of education systems. They develop models about how they think systems function to bring about education outcomes. Under Development and Innovation, investigators build on prior theoretical and empirical work to propose a theory of change for a specific intervention. The intervention, in essence, is an instantiation of the theory. Efficacy and Replication trials test the impact of specific interventions under limited conditions. Scale-up evaluations assess the impact of specific interventions when implemented under conditions of routine practice. Both Efficacy and Scale-up evaluations constitute tests of the theory (of change). Results from these studies should inform further theory development and refinement. Development and validation of assessments also contribute to theory development and theory testing. Taken together, work across the various goals should not only yield the practical benefits about the effects of specific interventions on education outcomes but also contribute to the bigger picture of scientific knowledge and theory on learning, instruction, and education systems.

PART II RESEARCH GRANT TOPICS

For FY-2011, the Institute's National Center for Education Research is accepting applications for research grants on June 24, 2010 and September 16, 2010. In this section, the Institute describes the 15 research grant topics.

Across its research programs, the National Center for Education Research is particularly interested in interventions for students who are from low income backgrounds and/or racial, ethnic, and linguistic minority groups that have underachieved academically, but will consider applications that focus on other populations if the results are likely to be applicable across socioeconomic, racial, ethnic, and linguistic categories.

3. CHANGES IN RESEARCH TOPICS

There are a number of changes to the Education Research Grants program (CFDA 84.305A) in FY-2011. Applicants should carefully read the requirements listed under each topic in Part II and in Part III. Major changes include the following:

Because the Institute is making a substantial investment in reading comprehension research through the Reading for Understanding Research Initiative (CFDA 84.305F) that was competed in FY-2010, the Institute is limiting the types of applications that will be accepted under the Reading and Writing research topic in FY-2011. Reading applications are limited to Exploration, Efficacy and Replication, Scale-up Evaluation, and Measurement (i.e., no Development and Innovation applications). Applicants interested in research on improving writing may apply under any of the goals.

The Institute has created a new research topic on Adult Education. Under this topic, individuals may apply to conduct research relevant to teaching adult learners reading, basic writing skills, and basic mathematics skills. Because of this new topic, the Institute is dropping the topic of Interventions for Struggling Adolescent and Adult Readers and Writers. Individuals interested in research on struggling adolescent readers or writers may apply under the Reading and Writing topic. Individuals interested in research on adult learners may apply to the Adult Education research topic.

The Institute is dropping the topic of Middle and High School Reform. Individuals may continue to apply for grants to conduct research on middle and high school reform under the Education Policy, Finance, and Systems topic.

The Institute is creating two new research programs to emphasize (1) the Organization and Management of Schools and Districts and (2) Analysis of Longitudinal Data to Support State and Local Education Reform.

Again, the Institute strongly advises all applicants to carefully read through the requirements listed for the topic under which they wish to apply and the requirements listed for the goal under which they wish to apply.

4. READING AND WRITING

Program Officer: Dr. Emily Doolittle (202-219-1201; Emily.Doolittle@ed.gov)

A. Purpose

Through its research program on Reading and Writing (Read/Write), the Institute intends to contribute to improvement of reading and writing skills by: (1) exploring malleable factors[2] (e.g., children's behaviors, instructional practices) that are associated with better reading or writing outcomes as well as mediators and moderators of the relations between these practices and student outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative curricula or instructional approaches for teaching individuals reading or writing skills or for addressing the underlying causes of reading or writing difficulties (e.g., poor oral language skills);[3] (3) evaluating the efficacy of fully developed curricula or instructional approaches for teaching reading or writing skills, or for reducing/preventing reading or writing difficulties through efficacy or replication trials; (4) evaluating the impact of curricula or instructional approaches for teaching reading or writing skills that are implemented at scale; and (5) developing and/or validating assessments of reading or writing that can be used by practitioners to support instruction.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, instructional approaches) that have been documented to be effective for improving reading and writing.

Because the Institute is investing substantial funds on reading research through the Reading for Understanding Research Initiative, the Institute will not accept applications to the Read/Write program to develop reading interventions in FY-2011. The Institute will, however, accept applications to develop writing interventions.

B. Background

The Institute began funding research on reading and writing in 2002. Since that time, 58 awards have been made under the Reading and Writing program with an additional 10 projects under the Interventions for Struggling Adolescent and Adult Readers and Writers topic. Approximately half of these projects are concerned with developing new interventions designed to support the reading and writing outcomes of learners from prekindergarten through adulthood. The Institute's goal structure encourages researchers not only to develop new interventions, but also to evaluate the causal effects of participating in these interventions on student outcomes. Of the projects funded since the goal structure was introduced in 2004, 32% are Efficacy and Replication or Scale-up Evaluation projects. Curricula being evaluated under these categories range from researcher-developed interventions, such as *Peer-Assisted Learning Strategies (PALS)* and the *Intelligent Tutoring System for the Structure Strategy (ITSS)*, to widely-used reading interventions such as *Open Court* and *Breakthrough to Literacy*. The Institute is also actively supporting measurement development projects, most of which are focused on assessing reading comprehension. Research on reading and writing interventions is also supported through several of the Institute's other research programs (e.g., Teacher Quality-Reading and Writing, Education Technology, Early Learning Programs and Policies, Cognition and Student Learning). To date, approximately 60 of these projects have focused on or are addressing how to improve literacy outcomes.

Through the Reading and Writing program, the vast majority of projects to date have focused on reading; only a few projects incorporate an explicit focus on writing. Although advances have been made in understanding how children learn to write, we have less systematic knowledge about how individuals become proficient writers. There is subsequently little agreement as to what a teacher can or should do to cultivate active, engaged, and proficient writers. On the 2007 NAEP writing assessment 24 percent of 12th graders were at or above the proficient level in writing; 18 percent could not write at the basic level. The Institute is interested in received additional applications focused on writing interventions.

Institute-supported research on reading has contributed to a growing body of knowledge of ways to improve the reading outcomes of elementary school readers. For example, one team has developed a

[2] By malleable factors, we mean factors that can be changed and are potential targets for intervention.
[3] For FY-2011, the Read/Write program is not accepting applications to develop reading interventions.

software program that utilizes students' beginning-of-the-year reading scores to develop an instructional profile of the type, duration, and timing of reading instruction recommended for each child and assigns children with similar profiles to reading groups for classroom instruction. This instructional profile information is designed to be used in conjunction with reading curricula currently used by schools. In an efficacy evaluation of this software program, the team found that, relative to children in the control classrooms, first grade students in the treatment group made greater gains in reading comprehension - in fact, there was about a two-month difference in grade equivalents between the groups. In classrooms in which teachers made greater use of the software program, almost every student, even those who started with weaker vocabulary scores, were reading at grade level by the end of the year (Connor, et al., 2007).

Under the Reading and Writing program, the Institute encourages researchers to explore malleable factors (e.g., children's behaviors, instructional practices) that are associated with better reading and writing outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential points of intervention. The Institute continues to solicit research on assessments of reading and writing appropriate for students from kindergarten through high school. The Institute is interested in applications to evaluate reading interventions and proposals to develop or evaluate writing interventions. *Again, because the Institute is investing substantial funds on reading research through the Reading for Understanding Research Initiative, the Institute will not accept applications to develop reading interventions in FY-2011.* However, the Institute will accept applications to develop writing interventions.

C. Specific Requirements

a. Submission to a specific goal

For the Reading and Writing topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Reading and Writing topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Read/Write program:

- Research must focus on students from kindergarten through Grade 12. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning Programs and Policies program or to the Read/Write program.
- Research must address reading or writing outcomes.
- For FY-2011 the Institute is *not* accepting applications to develop reading interventions (i.e., reading applications under the Development and Innovation goal).
- Interventions must be for use in schools, alternative school settings, or supplemental education services as defined in Section 1116(e) of the Elementary and Secondary Education Act of 1965, as amended.
- Researchers who are interested in conducting reading or writing research that addresses the needs of English learners may apply to the English Learners topic or the Read/Write topic.

5. MATHEMATICS AND SCIENCE EDUCATION

Program Officer: Dr. Christina Chhin (202-219-2280; Christina.Chhin@ed.gov)

A. Purpose

The Institute intends for the research program on Mathematics and Science Education (Math/Science) to fulfill five goals: (1) exploring malleable factors[4] (e.g., children's skills, instructional practices, curricula) that are associated with better mathematics or science outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative curricula and instructional approaches to mathematics and science education that will eventually result in improving mathematics and science achievement; (3) evaluating the efficacy of fully developed curricula and instructional approaches to mathematics and science education with efficacy or replication trials; (4) evaluating the impact of mathematics and science curricula and instructional approaches that are implemented at scale; and (5) developing and/or validating assessments of mathematics and science learning intended for use by practitioners.

The long-term outcome of this program will be an array of tools and strategies (e.g., curricula, programs, assessments) that have been demonstrated to be effective for improving or assessing mathematics and science learning and achievement.

B. Background

Current levels of mathematics and science achievement at the elementary and secondary levels suggest that the United States is neither preparing the general population with the levels of mathematics and science knowledge necessary for the 21st century workplace, nor producing an adequate pipeline to meet national needs for domestic scientists and mathematicians. In the 2005 National Assessment of Educational Progress (NAEP), only two percent of U.S. students attained advanced levels of mathematics or science achievement by twelfth grade. In mathematics, large numbers of U.S. students continue to score below the basic level. In the 2009 NAEP, 18 percent of fourth graders and 27 percent of eighth graders scored below the basic level in mathematics. On the 2005 NAEP, the most recent assessment of twelfth graders, 39 percent of twelfth graders scored below the basic level. At fourth grade, scoring below the basic level means that the student is likely to miss problems such as using a ruler to find the total length of three line segments. At twelfth grade, scoring below the basic level means that the student is unlikely to be able to solve problems such as finding the perimeter of a figure. Despite the fact that levels of mathematics achievement have improved over the past decade, achievement gaps remain wide with low levels of achievement being more likely among minority groups and students from low-income backgrounds.

As in mathematics, many U.S. students are not attaining mastery of rudimentary science knowledge and skills. In the 2005 NAEP, 32 percent of fourth-graders, 41 percent of eighth-graders, and 46 percent of twelfth-graders scored below the basic level in science. At fourth grade, students performing below the basic level are likely to miss problems such as using a data table to determine which day has the most daylight. At twelfth grade, students performing below the basic level are likely to miss problems such as graphing the populations of two species. As in mathematics, low levels of achievement are more likely among minority groups and students from low-income backgrounds.

The Mathematics and Science Education Research program began in 2003 and is one of the longest running programs in the Institute. Through this program, the Institute has supported 33 mathematics education research grants, 18 science education awards, and 4 grants that include both mathematics and science education. Of those projects focused on mathematics, approximately half are developing or refining interventions intended to improve the mathematics performance of K-12 students. Among the

[4] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

mathematics projects, the Institute is currently supporting 15 evaluations of the effects of specific interventions on student outcomes. Curricula being evaluated range from researcher-developed interventions, such as *Animal Watch* (an intelligent tutor designed to support pre-algebra students' learning), to widely-used mathematics curricula, such as *Everyday Mathematics* and *Cognitive Tutor*. In science education, most of the research teams are developing science curricula. The Institute is currently supporting 6 evaluations of the efficacy of science curriculum on student outcomes through the Math/Science program. For example, one team of researchers is evaluating the high school version of the *Biological Sciences Curriculum Study (BSCS)* through the Mathematics and Science Education Research program. The Institute encourages applications to evaluate the effects of science curricula on student achievement from K-12.

Research on mathematics and science interventions is also supported through some of the Institute's other research programs (e.g., Teacher Quality-Mathematics and Science, Education Technology, Early Learning Programs and Policies, and Cognition and Student Learning). To date, approximately 77 of these projects are examining how to improve mathematics and science outcomes. Unlike in the Mathematics and Science Education Research program, there is a greater balance between projects focused on mathematics and science content. In addition, through the National Research and Development Center on Cognition and Science Instruction, the Institute is supporting a team of researchers to refine and evaluate two widely-used middle school science curricula – Holt and FOSS.

The Institute intends for the Math/Science program to support research on curricula and instructional approaches intended to improve mathematics and science proficiency from kindergarten through high school. The Institute is primarily interested in interventions that address core mathematics and science content (e.g., Math: addition/subtraction, fractions, algebra, geometry, trigonometry, calculus; Science: physical science, earth science, life science). The Institute also encourages researchers to explore malleable factors (e.g., children's abilities and skills, instructional practices) that are associated with better mathematics or science outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention. This is translational research intended to inform the development of innovative programs, practices, or products to improve mathematics or science achievement. Finally, to improve mathematics and science skills, instruction may need to be tailored to the sources of difficulty that individual students experience. An ideal learning environment might involve regular and frequent assessment of skills and the possibility of individualized instruction for students based on the particular source of their difficulties. Under the Math/Science research program, the Institute invites proposals to develop and validate new assessments of, as well as proposals to validate existing measures of, mathematics or science learning to be used for instructional purposes (e.g., progress monitoring measures, diagnostic assessments).

C. Specific Requirements

a. Submission to a specific goal

For the Mathematics and Science Education research program, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Math/Science topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Math/Science program:

- Research must focus on mathematics or science education for students at any level from kindergarten through Grade 12. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning Programs and Policies program or to the Math/Science program.

- Interventions must be for use in schools, alternative school settings, or supplemental education services as defined in Section 1116(e) of the Elementary and Secondary Education Act of 1965, as amended.

- Researchers who are interested in conducting mathematics or science education research that addresses the needs of English learners may apply to the English Learners topic or the Math/Science topic.

- Researchers who are interested in teacher professional development in mathematics or science education should refer to the Teacher Quality - Math/Science program announcement.

6. COGNITION AND STUDENT LEARNING

Program Officer: Dr. Carol O'Donnell (202-208-3749; Carol.ODonnell@ed.gov)

A. Purpose

The purpose of the Cognition and Student Learning (Cognition) research program is to improve student learning by applying recent advances in cognitive science to education practice. The objectives of the Cognition research program are to: (1) explore underlying processes involved in reading, writing, mathematics, or science that are associated with student achievement in the relevant domain, for the purpose of identifying potential targets of intervention; (2) develop innovative interventions—instructional approaches, practices, and curricula—for improving student learning; (3) establish the efficacy of fully developed interventions and approaches for improving student learning with efficacy or replication trials; and (4) develop and/or validate measurement tools that can be used to improve student learning and achievement.

The long-term outcome of this program will be an array of tools and strategies (e.g., instructional approaches, computer tutors) that are based on principles of learning and information processing gained from cognitive science and that have been documented to be efficacious for improving learning in education delivery settings from prekindergarten through high school and for vocational or adult basic education or developmental (remedial)/bridge programs for under-prepared college students.

B. Background

The Cognition and Student Learning research program was first competed in FY-2002. Over the past 8 years, a total of 70 research projects have been supported. Focusing on a content domain such as mathematics, reading, science, or social studies, and working with learners from prekindergarten through college, most of the Cognition researchers examine ways to leverage underlying cognitive principles to revise instruction and support student learning. This research program has been instrumental in moving cognitive scientists from pure laboratory research into applied education contexts, where many teams are exploring the degree to which foundational cognitive principles generalize across learner ages, education settings, and academic content areas.

A subset of the Cognition researchers has been exploring ways in which implicit learning can help or hinder mastery of academic concepts. For example, when young children are first learning how to solve simple addition equations, they are expected to solve many problems in order to practice their addition facts. Often, these problem sets include multiple problems, all of which have the same form. The addends are on the left side of the equation, followed by the equal sign, and then the sum on the right

hand side of the equation (e.g., 1 +2 = 3; 4 + 5 = 9). When students' practice is limited to problems which share this structure, students may implicitly learn that the equal sign means "add it all up," even after explicit instruction in which the teacher explains that the equal sign means equivalence. This misunderstanding of the symbolic meaning of the equal sign has both short-term negative consequences for solving arithmetic problems that do not share this formal structure (e.g., where the sum is on the left side of the equation), and potential long-term negative effects when students are asked to solve algebraic equations. Recognizing the power of implicit learning to help, as well as hinder, the acquisition of the concept of mathematical equivalence, McNeil (2008) has explicitly tested whether providing students with opportunities to solve arithmetic problems with many different formal structures improves their conceptual understanding as well as their procedural fluency. A classroom-based experimental study testing this question found that varying where the equal sign is placed in typical second-grade arithmetic problems leads to improved understanding of mathematical equivalence when compared to a condition in which children practice the same number of problems using a traditional problem format, where the equal sign is always placed in the same location. In addition, there was no difference between groups in their levels of computational fluency. Although classroom teachers may know that second graders need many opportunities to solve addition problems, they may not recognize that the placement of the equal sign in the problems the students are required to solve can have such powerful influences on learning.

As a second example, consider the research of Kellman and Massey (2008). A fundamental discovery of perception research is that human cognition depends upon pattern recognition. One classic line of research finds that expert chess players perceive the chess board as composed of sets of pieces that make up possible moves; in contrast, novices perceive many individual pieces. It is rare, however, to find education interventions which leverage the perceptual foundations of cognition. Kellman and Massey decided to exploit the potential of perceptual learning by developing a computer-delivered intervention in which students are asked to match hundreds of instances of different representations of the same equation (e.g., a number sentence to the correct word problem) in 30-minute practice sessions. Students are not asked to solve these equations, but only to identify the representations which are equivalent. This repeated exposure to instances, with feedback as to whether the match is correct or incorrect, draws upon the human capacity to seek out structure, and turns out to be a powerful technique that has been found to improve short-term and long-term mastery of fractions.

Through the Cognition research program, the Institute supports research that utilizes cognitive science to develop and test innovative approaches intended to improve teaching and learning in authentic education settings. For typical Cognition projects, researchers begin by identifying a specific learning or instructional problem in schools, consider which findings from the empirical literature might be relevant to tackling the problem, and then propose a research plan for translating those findings into an education strategy that addresses the problem. Researchers should note that the Institute is interested in the development of strategies and materials that involve students learning educationally meaningful or relevant components or units of academic content, such as would be covered in a chapter or multiple chapters addressing a topic or learning goal in a textbook. The Institute strongly encourages cognitive scientists to collaborate with education researchers who understand teaching and learning in the context of authentic education settings.

Under the Cognition program, the Institute also funds projects designed to explore the cognitive processes underlying the acquisition of reading, writing, mathematics knowledge and skills, science knowledge and skills, or general study skills. This is translational research intended to inform the development of innovative programs, practices, or products to improve student outcomes. Such studies might include short-term longitudinal studies in which the objective is to identify the component processes and skills that are: (a) highly correlated with reading, writing, mathematics, or science proficiency in academic settings; and (b) can be improved, accelerated, or advanced through instruction. In order for applications to be competitive, the researcher should make explicit the hypothesized link between the underlying cognitive process and improving academic achievement. That is, it is not

sufficient to propose research to simply examine cognitive processes or skills. The objective here is to gain a better understanding of which processes and skills are predictive of subsequent proficiency in reading, writing, mathematics, science, or study skills that would allow researchers to develop interventions (e.g., curricula or instructional approaches) that target these processes and ultimately result in improving academic achievement. For example, a researcher might propose to measure early mathematical skills and correlate differences in the emergence of these skills with measures of academic achievement (e.g., performance on mathematics achievement tests in the elementary grades). Other Cognition Exploration projects might examine the underlying processes that explain learning problems (difficulties) that occur in authentic education settings. In these cases, researchers might begin by identifying a constellation of observed behaviors indicating an academic learning problem, and then propose a research plan to systematically explore possible causal explanations for that problem. For example, a group of first grade students may struggle with mastering addition facts, and repeated practice does not appear to improve the students' mastery of these facts. Researchers could propose to examine whether this problem was associated with a failure to initially learn the facts or a failure to retrieve the facts at the time of testing. If the first experiments indicate that students fail at initial learning, the research team could further examine if that initial failure to learn was explained by attentional patterns or visual spatial processing of the components of equations. As with all Exploration proposals, strong applications would include a rationale that justifies the plausibility of developing interventions that might improve the targeted underlying skills.

Finally, the Institute also encourages projects that address how principles and knowledge emerging from research in cognitive science can be used to better understand teacher knowledge and classroom practice, in order to improve teacher instructional practices and ultimately student learning. For example, researchers could identify teachers whose students typically gain more than students of the average teacher, conduct detailed observations to compare the instructional practices of high-gain teachers with average-gain teachers, and use these data to identify instructional approaches or patterns of instructional strategies that distinguish the two groups. The ultimate objective would be to obtain an understanding of the instructional approaches of high-gain teachers that would lead to the development of interventions.

C. Specific Requirements

a. Submission to a specific goal

For the Cognition and Student Learning topic, applicants must submit under one of four goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Measurement. The Institute does *not* accept applications under the Scale-up goal for the Cognition program. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Cognition topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Cognition program:

- Research must focus on reading, pre-reading, writing, pre-writing, mathematics, early mathematics, science, early science, or study skills for students from prekindergarten through Grade 12 or basic reading, writing, or mathematics skills or study skills for students in vocational or adult basic education or developmental (remedial)/bridge programs for under-prepared college students.

c. Research setting requirements
Under Exploration and Measurement, the research may be conducted in laboratory and/or authentic education settings. Under Exploration, laboratory research with college students is allowable provided that the researcher also examines the relation between the malleable factors and outcomes with the student population of interest within the award period.

Under Development and Innovation, the *majority* of the proposed work should be conducted in authentic education settings (e.g., elementary school classrooms, distance learning or online education delivery modes); however, some work may be conducted in laboratory settings. Laboratory and classroom research with college students may be proposed as a means to identify underlying principles or testing critical components of an intervention that is being developed. However, within the award period, the interventions must be tested for use with the student population for which the intervention is intended. These student populations along with the content requirements are described above in *Section 6.C.b. Content and sample requirements*.

Efficacy and Replication is appropriate for applicants proposing to evaluate fully developed interventions. The Institute does **not** support laboratory research under the Efficacy and Replication goal. Interventions that are ready to be evaluated through efficacy trials must be fully developed and ready to be implemented in authentic education settings.

7. TEACHER QUALITY – READING AND WRITING

Program Officer: Dr. Harold Himmelfarb (202-219-2031**;** Harold.Himmelfarb@ed.gov)

A. Purpose
The general purpose of the Institute's Teacher Quality – Reading and Writing (Teacher Quality - Read/Write) research program is to identify effective strategies for improving the performance of current classroom teachers in ways that increase student learning and school achievement. The Institute intends for the Teacher Quality – Read/Write research program to fulfill five goals: (1) exploring the relations between malleable factors[5] (e.g., practices of teachers and other instructional personnel; professional development programs) and student outcomes in reading or writing, as well as mediators and moderators of the relations between student outcomes and these malleable factors, for the purpose of identifying potential targets of intervention; (2) developing innovative programs and practices for teacher professional development that are intended to improve teacher practices and through them student learning and achievement; (3) evaluating the efficacy of teacher professional development programs and practices that are intended to improve teacher practices and through them student learning and achievement; (4) evaluating the effectiveness of teacher professional development programs that are implemented at scale and intended to improve teacher practices and through them student learning and achievement; and (5) developing and validating new assessments or validating existing assessments for teachers of reading or writing against measures of student achievement.

Under these goals, the Institute supports research on teacher professional development interventions and teacher assessments relevant to teaching reading or writing from kindergarten through Grade 12. By "professional development" the Institute refers to in-service training of or tools for current instructional personnel.

Long term outcomes of the Teacher Quality – Read/Write program will be an array of tools and strategies (e.g., in-service programs, assessments) that have been demonstrated to be effective for improving and assessing teacher performance in ways that are linked to increases in student achievement.

[5] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

B. Background

Too many U.S. students are not becoming proficient in basic academic knowledge and skills in reading and writing. Too many students are unable to understand what they read. On the 2007 National Assessment of Educational Progress (NAEP), 33 percent of fourth-graders and 26 percent of eighth-graders could not read at the basic level; on the 2005 NAEP, 27 percent of twelfth-graders could not read at the basic level. That is, when reading grade appropriate text, these students cannot extract the general meaning or make obvious connections between the text and their own experiences, or make simple inferences from the text. In other words, they cannot understand what they have read. By fourth grade, students are expected to learn new information by reading subject matter textbooks (Chall 1996). Poor reading skills may hinder students' progress in learning academic content in all areas. A similar picture emerges in the development of writing skills. On the 2002 NAEP writing assessment, 14 percent of fourth-graders could not write at the basic level; on the 2007 NAEP, 12 percent of eighth-graders and 18 percent of twelfth-graders could not write at the basic level.

Through the Teacher Quality – Read/Write research program, the Institute intends to improve the quality of teaching through research on teacher professional development programs. *Those interested in improving teacher quality through systemic practices and policies (e.g., alternative certification, incentives for recruiting and retaining highly qualified teachers) should refer to the topic on Education Policy, Finance, and Systems*.

Research on professional development interventions should consider both the content of the programs (i.e., what is it that personnel are expected to learn) as well as the delivery of the content (e.g., coaches, online resources, workshops). Very little research exists that allows for clear causal interpretations of the effect of specific professional development programs or for knowing which elements of professional development programs (e.g., coaching) are critical or relatively more important than others. There are many plausible hypotheses to explain why a professional development program might change teachers' instructional practices, for example, but not have an effect on student outcomes. One hypothesis is that although teachers' behaviors changed, the instructional practices were not implemented with sufficient precision to affect learning. This explanation suggests that the delivery of the content (e.g., coaching) needs to be improved. On the other hand, another possible explanation is that the instructional practices that were the target of the professional development program were not ones that would improve student learning even if they were implemented as intended (i.e., with high fidelity). This explanation suggests that the *content* of the program needs to be changed. The Institute encourages researchers to test different delivery modes using content (e.g., instructional practices or intervening strategies) that has already been shown to be effective for improving student outcomes. In all instances, the Institute encourages researchers to design studies that will provide evidence to help rule out competing hypotheses (e.g., including careful monitoring of teachers' practices so that fidelity and dosage can be assessed and collecting measures of students' behaviors that are closely aligned with the instructional practices and that may mediate changes between the teachers' practices and the ultimate student outcomes).

Whatever professional development model is proposed for study, the Institute expects the applicant to clearly delineate (a) what information will be communicated to teachers and (b) how that information will be delivered. For example, if coaches are delivering content to teachers, applicants would clearly describe (a) the content to be delivered, (b) what steps coaches are expected to follow to train the teachers, (c) how the coaches will be trained, (d) the frequency and duration of the intervention, and (e) how the coaching sessions will be observed to determine the degree to which coaches are delivering the expected content in the prescribed way (i.e., fidelity of implementation of the intervention). For this example, in strong applications, researchers would be careful to explain what the comparison group will receive so that reviewers can better determine if the project would move the field forward in terms of understanding why and how coaching works when it is effective, and under what conditions coaching is needed or not needed as a support to other forms of professional development.

Further, despite the bodies of research in the cognitive sciences that identify basic principles of knowledge acquisition and memory, and elaborate distinct differences in the ways that experts and novices organize and use information, it is not evident that developers of teacher professional development programs have utilized this knowledge base. The Institute strongly encourages those who propose to develop new professional development to build on this knowledge base (e.g., Anderson, Reder, & Simon 2000; Carver & Klahr 2001).

In addition to research on specific teacher professional development programs, the Teacher Quality – Read/Write program supports research on the development of practical assessments of teacher subject matter knowledge, pedagogical knowledge, and instructional skills, and validation of these assessments (or existing assessments) against measures of student learning and achievement. Understanding what skills and knowledge make a teacher effective, and identifying teacher candidates and current teachers who have these skills and knowledge is critical to developing a highly qualified teacher workforce. Ideally, assessments of pedagogical knowledge and skills and subject matter knowledge would not only predict student achievement but also be practical to administer and cost-effective. The Institute is interested in proposals to *validate existing measures* of pedagogical knowledge and subject matter knowledge against measures of student learning and achievement as well as proposals to *develop and validate new measures*.

The Institute also invites applications to develop and/or validate measures of teacher practices that could be used by schools to provide feedback to teachers and improve the quality of classroom instruction; such measures need to be validated against measures of student learning.

The Institute particularly encourages researchers to explore the relations between malleable factors (e.g., teachers' skills or knowledge, professional development programs) and student outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets for interventions. This is translational research intended to inform the development of innovative programs, practices, or products to improve student outcomes. One approach to the identification of malleable factors is for researchers to conduct detailed, quantifiable observations of teacher practices (types of instruction, frequency, duration, under what circumstances), and then use these data, in conjunction with child characteristics, to predict subsequent child outcomes. The goal here is to identify teacher practices that are strongly associated with better student outcomes. Researchers who can identify strong correlates of student performance could use this information as the basis for developing a professional development intervention.

C. Specific Requirements

a. Submission to a specific goal

For the Teacher Quality – Read/Write topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Teacher Quality – Read/Write topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Teacher Quality – Read/Write program:

- Applications must be relevant to the instruction of reading or writing for students in any grade(s) from kindergarten through Grade 12. Applicants interested in professional development for prekindergarten teachers should apply to the Early Learning Programs and Policies topic. If the

research spans prekindergarten and kindergarten, applicants may choose to submit the application to the Early Learning Programs and Policies program or to the Teacher Quality – Read/Write program.

- Applications submitted to the Teacher Quality – Read/Write topic must be relevant to programs for teachers or other instructional personnel of typically developing students.
- Interventions must be professional development training or other supports (e.g., information resources) for teachers or other instructional personnel. Professional development refers to in-service training for current personnel. Research (e.g., development, evaluation) on pre-service training programs for prospective teachers is not eligible for support under this research program.
- All applicants must include measures of child outcomes as well as measures of the behaviors of the teachers or other instructional personnel that are the target of the professional development.
- Research on assessment must include validation of the proposed assessment (new or existing) against student outcomes. Assessments may focus on teacher subject matter, pedagogical knowledge, or instructional practices. Assessments must be of a core academic content area (e.g., reading, writing, social studies, history), but not in mathematics or science.
- Applicants interested in professional development for teachers of English learners may choose to apply to the English Learner topic or to the Teacher Quality – Read/Write program.

Applicants interested in improving teacher quality through systemic practices and policies (e.g., alternative certification, incentives for recruiting and retaining highly qualified teachers) should apply to the Education Policy, Finance, and Systems research program.

c. Distinction between the Teacher Quality – Read/Write topic and the Reading and Writing topic

Applicants sometimes wonder whether the project they plan to propose is more appropriate for the Teacher Quality – Read/Write topic or for the Read/Write topic. In general, applications that are appropriate for the Read/Write topic are those that develop or evaluate specific curricula or instructional approaches for students, whereas applications that are appropriate for the Teacher Quality – Read/Write program are those that have teachers or other instructional personnel as the primary target of the intervention. The Institute recognizes that this distinction may be blurred. Oftentimes, for example, implementation of a specific curriculum includes training for personnel on how to best deliver the curriculum, but the focus of the intervention is the new curriculum for students. Similarly, implementation of a new instructional approach almost always includes training for teachers on the instructional approach, but the focus of the intervention is on a different approach for teaching students, not on different ways to train instructional personnel. From the Institute's perspective, as long as the application meets the specific requirements listed for the research topic (e.g., Teacher Quality – Read/Write, Read/Write), applicants may decide to submit to that topic. For example, suppose an applicant is interested in testing a particular intervention intended to improve writing skills of middle school students and intends to train teachers to deliver this intervention. As long as the application meets the specific requirements listed for the research topic, the applicant may choose to submit to either to the Read/Write program or to the Teacher Quality – Read/Write program.

8. TEACHER QUALITY – MATHEMATICS AND SCIENCE EDUCATION

Program Officer: Dr. Harold Himmelfarb (202-219-2031; Harold.Himmelfarb@ed.gov)

A. Purpose

The general purpose of the Institute's Teacher Quality–Mathematics and Science (Teacher Quality – Math/Science) research program is to identify effective strategies for improving the performance of current classroom teachers in ways that increase student learning and school achievement in mathematics and science. The Institute intends for the Teacher Quality – Math/Science research program to fulfill five goals: (1) exploring the relations between malleable factors[6] (e.g., practices of teachers and other instructional personnel; professional development programs) and student outcomes in mathematics or science, as well as mediators and moderators of the relations between student outcomes and these malleable factors, for the purpose of identifying potential targets of intervention; (2) developing innovative programs and practices for teacher professional development that are intended to improve teacher practices and through them student learning and achievement; (3) evaluating the efficacy of teacher professional development programs and practices that are intended to improve teacher practices and through them student learning and achievement; (4) evaluating the effectiveness of teacher professional development programs that are implemented at scale and intended to improve teacher practices and through them student learning and achievement; and (5) developing and validating new assessments or validating existing assessments of teachers of mathematics or science against measures of student achievement.

Under these goals, the Institute supports research on teacher professional development interventions and teacher assessments relevant to (a) teaching mathematics or science from kindergarten through high school and (b) teaching basic skills in mathematics to adults. By "professional development" the Institute refers to in-service training of or tools for current instructional personnel. Long term outcomes of the Teacher Quality – Math/Science program will be an array of tools and strategies (e.g., in-service programs, assessments) that have been demonstrated to be effective for improving and assessing teacher performance in ways that are linked to increases in student achievement.

B. Background

Current levels of mathematics and science achievement at the elementary and secondary levels suggest that the United States is neither preparing the general population with levels of mathematics and science knowledge necessary for the 21st century workplace, nor producing an adequate pipeline to meet national needs for domestic scientists and mathematicians. On the 2005 National Assessment of Educational Progress (NAEP), only 2 percent of U.S. students attained advanced levels of mathematics or science achievement by twelfth grade. In mathematics, large numbers of U.S. students continue to score below the basic level. On the 2007 NAEP, 18 percent of fourth-graders and 29 percent of eighth-graders scored below the basic level in mathematics. On the 2005 NAEP, the most recent assessment of twelfth-graders, 39 percent of twelfth-graders scored below the basic level. At fourth grade, scoring below the basic level means that the student is likely to miss problems such as using a ruler to find the total length of three line segments. At twelfth grade, scoring below the basic level means that the student is unlikely to be able to solve problems such as finding the perimeter of a figure. Despite the fact that levels of mathematics achievement have improved over the past decade, achievement gaps remain wide with low levels of achievement being more likely among minority groups and students from low-income backgrounds.

As in mathematics, many U.S. students are not attaining mastery of rudimentary science knowledge and skills. On the 2005 NAEP, 32 percent of fourth-graders, 41 percent of eighth-graders, and 46 percent of twelfth-graders scored below the basic level in science. At fourth grade, students performing below the

[6] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

basic level are likely to miss problems such as using a data table to determine which day has the most daylight. At twelfth grade, students performing below the basic level are likely to miss problems such as graphing the populations of two species. As in mathematics, low levels of achievement are more likely among minority groups and students from low-income backgrounds.

Through the Teacher Quality – Math/Science research program, the Institute intends to improve the quality of teaching through research on teacher professional development programs. *Those interested in improving teacher quality through systemic practices and policies (e.g., alternative certification, incentives for recruiting and retaining highly qualified teachers) should refer to the topic on Education Policy, Finance, and Systems.*

The Institute intends for the Teacher Quality–Math/Science program to support research to develop innovative professional development that address core mathematics and science content (e.g., Math: addition/subtraction, fractions, algebra, geometry, trigonometry, calculus; Science: physical science, earth science, life science), as well as research to evaluate the impact of teacher professional development programs on teacher behaviors and student outcomes.

Research on professional development interventions should consider both the content of the programs (i.e., what is it that personnel are expected to learn) as well as the delivery of the content (e.g., coaches, online resources, workshops). Very little research exists that allows for clear causal interpretations of the effect of specific professional development programs or for knowing which elements of professional development programs (e.g., coaching) are critical or relatively more important than others. There are many plausible hypotheses to explain why a professional development program might change teachers' instructional practices, for example, but not have an effect on student outcomes. One hypothesis is that although teachers' behaviors changed, the instructional practices were not implemented with sufficient precision to affect learning. This explanation suggests that the delivery of the content (e.g., coaching) needs to be improved. On the other hand, another possible explanation is that the instructional practices that were the target of the professional development program were not ones that would improve student learning even if they were implemented as intended (i.e., with high fidelity). This explanation suggests that the *content* of the program needs to be changed. The Institute encourages researchers to test different delivery modes using content (e.g., instructional practices or intervening strategies) that has already been shown to be effective for improving student outcomes. In all instances, the Institute encourages researchers to design studies that will provide evidence to help rule out competing hypotheses (e.g., including careful monitoring of teachers' practices so that fidelity and dosage can be assessed and collecting measures of students' behaviors that are closely aligned with the instructional practices and that may mediate changes between the teachers' practices and the ultimate student outcomes).

Whatever professional development model is proposed for study, the Institute expects the applicant to clearly delineate what information will be communicated to teachers and how that information will be delivered. For example, if coaches are delivering content to teachers, applicants should clearly describe (a) the content to be delivered, (b) what steps coaches are expected to follow to train the teachers, (c) how the coaches will be trained, (d) the frequency and duration of the intervention, and (e) how the coaching sessions will be observed to determine the degree to which coaches are delivering the expected content in the prescribed way (i.e., fidelity of implementation of the intervention). In strong applications, researchers are careful to explain what the comparison group will receive so that reviewers can better determine if the project would move the field forward in terms of understanding why and how coaching works when it is effective, and under what conditions coaching is needed or not needed as a support to other forms of professional development.

Further, despite the bodies of research in the cognitive sciences that identify basic principles of knowledge acquisition and memory, and elaborate distinct differences in the ways that experts and novices organize and use information, it is not evident that developers of teacher professional

development programs have utilized this knowledge base. The Institute strongly encourages those who propose to develop new professional development to build on this knowledge base (e.g., Anderson, Reder, & Simon 2000; Carver & Klahr 2001).

In addition to research on the development and evaluation of teacher professional development programs, the Teacher Quality – Math/Science program supports research on the development of practical assessments of teacher subject matter knowledge, pedagogical knowledge, and instructional skills, and validation of these assessments (or existing assessments) against measures of student learning and achievement. Understanding what skills and knowledge make a teacher effective, and identifying teacher candidates and current teachers who have these skills and knowledge is critical to developing a highly qualified teacher workforce. Ideally, assessments of pedagogical knowledge and skills and subject matter knowledge would not only predict student achievement but also be practical to administer and cost-effective. The Institute is interested in proposals to *validate existing measures* of pedagogical knowledge and subject matter knowledge against measures of student learning and achievement as well as proposals to *develop and validate new measures*.

The Institute also invites applications to develop and/or validate measures of teacher practices that could be used by schools to provide feedback to teachers and improve the quality of classroom instruction; such measures must be validated against measures of student achievement.

The Institute particularly encourages researchers to explore the relations between malleable factors (e.g., teachers' skills or knowledge, professional development programs) and student outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets for interventions. This is translational research intended to inform the development of innovative programs, practices, or products to improve student outcomes. One approach to the identification of malleable factors is for researchers to conduct detailed, quantifiable observations of teacher practices (types of instruction, frequency, duration, under what circumstances), and then use these data in conjunction with child characteristics to predict subsequent child outcomes. The goal here is to identify teacher practices that are strongly associated with better student outcomes. Researchers following this strategy who can identify strong correlates of student performance could use this information as the basis for developing a professional development intervention. Another approach is to conduct multivariate analyses of district or state databases in order to identify existing programs and practices that may be associated with better student outcomes and to examine factors and conditions that may mediate or moderate the relations between the student outcomes and these programs and practices.

C. Specific Requirements

a. Submission to a specific goal

For the Teacher Quality – Math/Science topic, applicants must submit one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Teacher Quality – Math/Science topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Teacher Quality–Math/Science program:

- Applications must be relevant to the instruction of mathematics or science for students in any grade(s) from kindergarten through Grade 12. Applicants interested in professional

development for prekindergarten teachers should apply to the Early Learning Programs and Policies topic. If the research spans prekindergarten and kindergarten, applicants may choose to submit the application to the Early Learning Programs and Policies program or to the Teacher Quality – Math/Science program.

- Applications submitted to the Teacher Quality–Math/Science program must be relevant to programs for teachers of typically developing students.
- Interventions must be professional development training or other supports (e.g., information resources) for teachers or other instructional personnel. Professional development refers to in-service training for current personnel. Development or evaluation of pre-service training programs for prospective teachers is not eligible for support under this research program.
- All applicants must include measures of child outcomes as well as measures of the behaviors of the teachers or other instructional personnel that are the target of the professional development.
- Research on assessment must include validation of the proposed assessment (new or existing) against student outcomes. Assessments may focus on teacher subject matter, pedagogical knowledge, or instructional practices. Assessments must be relative to mathematics or science instruction.
- Applicants interested in professional development for teachers of English learners may choose to apply to the English Learner topic or to the Teacher Quality – Math/Science program.

Applicants interested in improving teacher quality through systemic practices and policies (e.g., alternative certification, incentives for recruiting and retaining highly qualified teachers) should apply to the Education Policy, Finance, and Systems research program.

c. Distinction between the Teacher Quality – Math/Science topic and the Mathematics and Science Education topic

Applicants sometimes wonder whether the project they plan to propose is more appropriate for the Teacher Quality – Math/Science topic or for the Math/Science topic. In general, applications that are appropriate for the Math/Science topic are those that develop or evaluate specific curricula or instructional approaches for students, whereas applications that are appropriate for the Teacher Quality – Math/Science program are those that have teachers or other instructional personnel as the primary target of the intervention. The Institute recognizes that this distinction may be blurred. Oftentimes, for example, implementation of a specific curriculum includes training for personnel on how to best deliver the curriculum, but the focus of the intervention is the new curriculum for students. Similarly, implementation of a new instructional approach almost always includes training for teachers on the instructional approach, but the focus of the intervention is on a different approach for teaching students, not on different ways to train instructional personnel. From the Institute's perspective, as long as the application meets the specific requirements listed for the research topic (e.g., Teacher Quality – Math/Science, Math/Science), applicants may decide to submit to that topic. For example, suppose an applicant is interested in testing a particular intervention intended to improve mathematics skills of middle school students and intends to train teachers to deliver this intervention. As long as the application meets the specific requirements listed for the research topic, the applicant may choose to submit to either to the Math/Science program or to the Teacher Quality – Math/Science program.

9. SOCIAL AND BEHAVIORAL CONTEXT FOR ACADEMIC LEARNING

Program Officer: Dr. Emily Doolittle (202-219-1201; Emily.Doolittle@ed.gov)

A. Purpose

Through its Social and Behavioral Context for Academic Learning (Social/Behavioral) research program, the Institute supports research on interventions designed to improve social skills and behaviors that

support academic and other important school-related outcomes (e.g. attendance, high school graduation rates) in typically developing students from kindergarten through high school. Under this research grant program, the Institute will fund research to (1) explore malleable factors[7] (e.g., children's skills, classroom management practices, professional development programs) that are associated with better social skills and behaviors that support academic learning, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention; (2) develop innovative programs and practices for improving social skills and behaviors that support academic learning; (3) evaluate fully developed programs and practices for improving social skills and behaviors that support academic learning through efficacy or replication trials; (4) evaluate the impact of programs and practices for improving social skills and behaviors that support academic learning that are implemented at scale; and (5) develop and validate measures of teacher classroom management practices and child social skills and behaviors that support learning in school.

The long-term outcome of this program will be an array of tools and strategies (e.g. assessment tools and behavioral interventions) that have been documented to be effective for improving or assessing social skills and behaviors that support academic and other important school-related outcomes of students from kindergarten through high school.

B. Background

Despite great interest and effort among educators, researchers, and parents, the behavior problems of children and adolescents in schools continue to be a major source of public concern. A substantial body of literature has shown that disruptive classroom behavior, conduct problems, aggression, delinquency, and substance use are associated with poor academic achievement, as well as a lack of school connectedness and involvement (e.g., Najaka, Gottfredson, & Wilson 2001). The National Center for Education Statistics (2001) reported that students between the ages of 12 and 18 are victim to some 2.5 million crimes of violence or theft at school each year. On the positive side, social competencies have been linked with higher levels of achievement and school adjustment (e.g., Carlson et al. 1999; Malecki & Elliot 2002; Wentzel 1993).

School interventions aimed at reducing negative behaviors (e.g. disruptions to classroom instruction, anti-social behaviors, bullying, suspensions, absenteeism) and increasing academic competencies (e.g. academic achievement) have proliferated in the past 20 years. To date, many of the classroom or school-based strategies and techniques used by teachers and other school personnel have not been subject to rigorous evidence-based research. Although schools commonly use support services, intervention curricula, and discipline management strategies to prevent problem behavior and to promote social skills that support learning in academic contexts, evidence of effectiveness is limited (e.g., Gottfredson and Gottfredson 2001). There have been evaluations of promising elementary school-based programs, in particular programs based on social, cognitive, developmental, and ecological theory; however, many evaluations have suffered from a lack of rigorous methodology, design, and analysis (e.g., small sample sizes and low statistical power, severe attrition, lack of randomization to condition, and inappropriate level of analysis). Through the Social/Behavioral research program, the Institute intends to address this problem by supporting research to develop or evaluate classroom or school interventions designed to improve the academic learning context by promoting positive student behaviors or reducing negative student behaviors that are correlated with academic outcomes.

Teachers and parents report a need for better classroom management practices (e.g., Evertson and Weinstein 2006). Beginning teachers in their early teaching years consistently rank classroom management as their most pressing concern, and it continues to be a major cause of job dissatisfaction and teacher burnout. Classroom management consistently ranks as the first or second most serious educational problem in the eyes of the general public. Through the Social/Behavioral research program,

[7] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

the Institute endeavors to address this problem by supporting research on teacher professional development programs to improve classroom management skills.

Across its education research programs, the Institute supports research to explore the relations between malleable factors (i.e., things that can be changed, such as student competencies and education practices) and education outcomes in order to identify potential targets of interventions. This is translational research intended to inform the development of innovative programs, practices, or products to improve student outcomes. Under the Social/Behavioral research program, malleable factors may be those social skills and behaviors (e.g., self-regulation) that support student learning and would be correlated with education outcomes (e.g., grades, test scores, graduation rates). In addition, malleable factors appropriate for the Social/Behavioral research program include classroom management strategies, as well as programs and practices for improving those social skills and behaviors that support student learning. For example, researchers could propose to conduct detailed, quantifiable observations of classroom management practices (e.g., types of strategies, frequency, duration, under what circumstances), and then use these data to predict subsequent student social, behavioral and academic outcomes. The purpose of the study would be to identify what type or combination of classroom management practice is associated with better student behaviors and academic achievement. Researchers who can identify strong correlates of student outcomes could use this information as the basis for developing an intervention.

Under the Social/Behavioral research program, the Institute seeks to encourage rigorous research on interventions that are implemented in schools for the purpose of improving the social and behavioral context of academic learning. Examples of interventions appropriate for development or evaluation under the Social/Behavioral research program include (a) curricula designed to improve students' social and behavioral skills for succeeding in school, (b) classroom behavior management programs, (c) teacher professional development programs intended to improve teachers' behavior management practices in the classroom, and (d) curricula designed to reduce student anti-social behavior (e.g. aggression, delinquency, bullying) in the classroom or school.

The Institute recognizes that applicants to the Social/Behavioral research program typically propose models that involve multiple steps. For example, an applicant might choose to evaluate a program intended to improve teachers' classroom management skills. A simple illustration of a model of change for this program is:

Intervention		Mediator		Mediator		Mediator		Student Academic Outcome
Teacher training on classroom management strategies	→	Change teachers' classroom practices	→	Reduce student disruptive behaviors	→	Increase instruction time Improve students' engagement Reduce suspensions	→	Increase Grades Increase Test scores Increase Graduation Rates

In this model, improved student academic outcomes are the most distal outcome that the intervention seeks to improve. The Institute requires applicants to obtain measures of student academic outcomes (e.g., grades, test scores). In strong applications, researchers would also propose to measure the

mediators between the intervention (teacher training on classroom management strategies) and the academic outcomes (e.g., teachers' classroom practices, students' disruptive behaviors, increased instruction time).

The Institute invites proposals to support the development and validation of new assessments or validation of existing measures of children's social skills and behaviors that support learning in school and assessments of teacher classroom management practices from kindergarten through high school. Measures of classroom management practices could be used to assess the effectiveness of teacher practices and should be validated against both student behavioral outcomes and academic outcomes in order to support the hypothesized pathway from improved classroom management practices to improved academic achievement that is mediated by improved student behaviors.

C. Specific Requirements

a. Submission to a specific goal

For the Social/Behavioral topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Social/Behavioral topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Social/Behavioral program:

- Research must focus on students from kindergarten through Grade 12. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning Programs and Policies program or to the Social/Behavioral program. For example, an applicant may submit an exploration study in which development of social-emotional skills is followed from prekindergarten through Grade 1 to Early Learning Programs and Policies or to Social/Behavioral program.
- Research must address social skills or behaviors that are correlated with academic outcomes.
- The Institute will support research on interventions for students that are implemented by teachers, other school staff (e.g., school administrators, guidance counselors, school psychologists), or school-affiliated staff (e.g., clinical psychologists working with a school district) and research on professional development training programs for teachers and other school staff that are intended to provide staff with skills to improve the social and behavioral context for academic learning from kindergarten through high school.
- All applicants must include measures of students' education outcomes. By education outcomes, the Institute means those measures of learning and achievement that are important to parents, teachers, and school administrators (e.g., grades, achievement test scores, grade retention, graduation rates, drop-out rates).

10. EDUCATION LEADERSHIP

Program Officer: Dr. Katina Stapleton (202-219-2154; Katina.Stapleton@ed.gov)

A. Purpose

The Institute's Education Leadership research program addresses five goals: (1) exploring malleable factors[8] (e.g., skills of principals; management practices) that are associated with better student outcomes for students from kindergarten through high school, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative programs and practices for the professional development, recruitment, or retention of education leaders that will result in improving the teaching and learning environment at the local level and, ultimately, student learning and achievement; (3) evaluating the efficacy of programs and practices for the professional development, recruitment, or retention of education leaders for improving the teaching and learning environment and, ultimately, student learning and achievement; (4) evaluating the impact of programs and practices for the professional development, recruitment, or retention of education leaders that are implemented at scale and intended for improving the teaching and learning environment and through it, student learning and achievement; and (5) developing and validating new assessments of the quality of education leaders, or validating existing assessments of education leaders against measures of student achievement from kindergarten through high school.

Long-term outcomes of the Education Leadership program will be an array of tools and strategies (e.g., in-service programs, policies, assessments) that have been demonstrated to be effective for improving and assessing the performance of education leaders (e.g., principals, superintendents) in ways that are linked to increases in student achievement. By "professional development" the Institute refers to in-service training for current education leaders.

B. Background

Through the Education Leadership research program, the Institute supports research to improve the quality of leadership and administration at the local level (e.g., building, district, region) in order to enhance the teaching and learning environment for students and thereby improve student outcomes. This program is intended to support research on innovative approaches to the recruitment and retention of education leaders, as well as the development and evaluation of professional development programs for education leaders. Innovative approaches to recruitment of education leaders include alternative pathways to school leadership that are designed to eliminate barriers that keep talented potential school leaders from joining the profession, and to provide the preparation and support necessary for these leaders to effectively function in today's complex education environment.

Although existing research suggests that by establishing conditions that support and strengthen teaching and learning, education leaders may have an indirect effect on student achievement, little rigorous research has addressed this topic. A recent meta-analysis suggests that there may be specific leadership practices that are associated with higher student achievement (Waters, Marzano, & McNulty, 2003). Much, however, is unknown about the causal impact of leadership practices on the teaching and learning environment and, subsequently, on student learning. Some researchers have suggested that conventional principal preparation programs are misaligned with the skill-sets and knowledge actually needed by principals on a day-to-day basis (e.g., Hess & Kelly, 2005). However, there has been little systematic empirical research examining the full range of skills and knowledge (e.g., in areas such as finance, instruction, assessment, and accountability) needed by principals, and their relation to the quality of the teaching and learning environment and, in turn, to student achievement. Nor is there much research examining how these needed skills and knowledge might vary according to school context

[8] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

(teacher turnover, poverty status, parental involvement, political and policy environments). Little systematic research has been conducted to determine the effects on student learning of making different choices in leadership-related strategies or investments at the state or district level (e.g., recruitment or performance incentives, principal placements, leadership evaluations). Limited research exists on whether and how district-level leaders (e.g., superintendents, school boards) influence student learning; most empirical research on education leadership has focused on principals. Moreover, we know little about how variations in leadership roles and functions across schools or districts are associated with student achievement, or about the differential leadership needs of schools with differing management structures (e.g., schools operating under site-based management or reconstitution). The types of projects that are appropriate for this program are illustrated by, but not limited to, the examples provided here.

Through the Education Leadership research program, the Institute encourages the development of innovative in-service professional development for education leaders that draws on lessons learned from professional development in other fields (e.g., business administration, public administration, organizational psychology, public health). By way of illustration, an applicant might use existing research in organizational management to propose that performance on a set of specific practices would distinguish between highly effective and less effective principals.

The Institute invites proposals to develop assessments to measure the performance of principals and other building or district-level leaders, and validate such measures against student performance. The Institute's concern is to provide practitioners with instruments that will be useful for giving feedback that enables leaders to identify the specific actions they need to take to improve their performance and ultimately the outcomes of the students for whom they are responsible. These actions would be operationalized at a relatively specific level. For example, an overarching category might be "providing a vision for the school" and include subcategories such as, developing goals and strategies for attaining goals; communicating vision to staff, students, parents, and community; monitoring progress; and initiating corrective actions. Items for each subcategory (e.g., monitoring progress) would address specific practices or behaviors that are used to meet the objective of that subcategory (e.g., has an established schedule for assessing progress on each goal, regularly communicates progress on each goal to staff). For a Measurement project, the applicant could propose to develop this instrument and then validate it against relevant school and student outcomes. The Institute recognizes that the critical skills that principals (or other leaders) need to exercise to improve their school's overall student performance may differ depending on the school's starting point (e.g., skills for transforming chronically low-performing schools may be different from maintaining steady progress for schools that are making adequate yearly progress) and that instruments may be nuanced by such conditions.

In general, the Institute does not provide funding for research on pre-service leadership training programs. However, the Institute does intend for the Education Leadership research program to produce a body of knowledge that will guide the development of pre-service leadership training. For example, researchers who are interested in pre-service leadership training could conduct research utilizing current leaders in order to identify those leadership skills, knowledge, and practices that are most strongly associated with better student outcomes and to develop and/or evaluate in-service professional development interventions that are intended to improve the skills and knowledge of education leaders in ways that are associated with better student outcomes. Researchers who can identify and train current principals, for example, in ways that lead to better school outcomes can use this information to inform pre-service leadership training programs.

Although the Institute does not generally support research on pre-service leadership programs, the Institute will support research on alternative certification pathways (and their components). By "alternative certification pathways" the Institute means relatively short programs that are intended to provide intensive training to professionals and have them leading schools within 18 to 24 months. Such programs lend themselves to rigorous research, in part, because the effects of the programs can be

evaluated against school and student outcomes within the time period for an award (e.g., Efficacy and Replication awards are for a maximum of four years).

C. Specific Requirements

a. Submission to a specific goal

For the Education Leadership topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Education Leadership topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Education Leadership program:

- Research must address education leadership, including knowledge and practices of education leaders, leadership policies, and professional development programs for education leaders. By education leader, the Institute refers to building, district, or regional administrators and decision-makers, including principals, superintendents and other district administrators who have administrative or managerial responsibilities. Researchers interested in teacher-leaders who do not have administrative or managerial responsibilities should refer to the Teacher Quality research programs.

- Research must address education leadership for kindergarten through Grade 12. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning Programs and Policies program or to the Education Leadership program.

- All applicants must include measures of student education outcomes (e.g., end-of-course exams, graduation rates, disciplinary actions, scores on state assessments).

11. ORGANIZATION AND MANAGEMENT OF SCHOOLS AND DISTRICTS

Program Officer: Dr. Allen Ruby (202-219-1591; Allen.Ruby@ed.gov)

A. Purpose

In an effort to examine schools and districts as organizations and study their functions as coordinated wholes, the Institute has created the Organization and Management of Schools and Districts (Organization/Management) research program. Organizational factors of interest include, but are not limited to, instructional program coherence; peer learning among teachers; trust and relationships among adults and students; resource and time allocation; collective responsibility for student success; and parent and community relationships; the use of data and feedback systems to improve instruction.

This program will address five goals: (1) exploring malleable factors[8] (e.g., organizational structure, management practices) that are associated with better education outcomes (e.g., high school graduation rates, student achievement), as well as mediators and moderators of the relations between these factors and education outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative organizational strategies and management practices that are intended to improve student education outcomes either directly or indirectly by improving the way in which schools and/or districts operate; (3) evaluating the efficacy of organizational strategies and management practices that are

intended to improve student outcomes either directly or indirectly by improving the way in which schools and/or districts operate; (4) evaluating the impact of organizational strategies and management practices that are implemented at scale and are intended to improve student outcomes either directly or indirectly by improving the way in which schools and/or districts operate; and (5) developing practical measures of the organizational strategies and management practices of schools and school systems and validating such measures against student outcomes.

The long-term outcome of this program will be an array of tools and processes (e.g., assessments, organizational strategies, management practices, and policies and programs to foster the latter) that have been documented to be effective for improving the way in which schools and/or district operate and thereby improving student outcomes.

B. Background

How a school or district structures and uses its resources has major implications for the approach it takes to instruction and learning, the impact of its resources on student achievement, and the potential success of educational reforms it adopts to improve instruction and learning. Through the Organization/Management program, the Institute supports research to improve student learning and achievement through (a) the examination of educational resources broadly defined including human capital (e.g., attributes of the staff), social assets (e.g., school climate, sense of trust among staff and students or sense of collective staff responsibility for student success), financial assets (funds available and how they are allocated), time assets (the school year and school day and how they are organized), and physical assets (e.g., the building and facilities), (b) how these resources are drawn upon and structured to carry out the academic functions of the school or district, (c) and how these resources might be better developed, organized, managed, used and maintained to improve student achievement.

Through the Organization/Management program, the Institute seeks to support work on issues that schools and districts must make decisions about and act on every day. Will a longer school day or school year lead to improved student outcomes? Are there ways to schedule the day so that time lost to management needs is reduced and students learn more? Are there ways to reduce the impacts of student overcrowding? How should a district allocate staff with different backgrounds and skills (e.g., generalists vs. specialists) to maximize benefits for students?

Under the Organization/Management program, the Institute also encourages research to address the social aspects of the school that may be difficult to identify. For example, the climate of the school and the classroom, teachers' expectations for their students, and the degree to which teachers work alone or in collaboration have been linked to student outcomes and the success of interventions. If a school's climate is not a supportive environment for students and staff, what can school and/or district leaders do to change that environment? How can a school organize itself to promote peer learning among teachers? Are there ways to facilitate productive collaboration among teachers who have been working alone for many years? What can school leaders, teachers, and students do to make the culture of their school one that supports teaching and learning?

Related to the indirect effects that a school's organization and management may have on student outcomes is how it may affect the adoption of new programs and practices that are intended to improve student outcomes. This concerns both the organization of the school and the organization of the intervention. On the one hand, failure to successfully implement a new intervention has been linked to disbelief among the staff that interventions will work and to poor staff morale (e.g., see Payne 2008). On the other hand, interventions that are well-aligned to a school's organization and mission may be easier to integrate into the school and therefore may be implemented with higher quality and stand a greater chance of being sustained (Datnow, Hubbard, & Mehan, 2002). A related issue is how a school can manage the introduction of multiple interventions on top of its own programs and practices to ensure that they work together in supporting the goals of the school. For instance, in the key function of

instruction, achieving a coherent instructional program within a school is not always easy though it has been linked to student achievement (Newmann, et al., 2001).

By examining individual aspects of schools, education researchers are able to identify what works in a specific area and how it may be improved; this new program enables researchers to study these in the context of a whole school. Through the Organization/Management program, the Institute encourages research to identify optimal combinations of the different functions of a school, how the combinations might vary depending on the school's resources and the population it serves, and how a school might learn to implement the most applicable combination.

The Institute also recognizes that the neighborhood or community that surrounds a school contributes to the variation in the organization and management of schools and their related success in supporting student achievement. For example, schools serving highly transient and/or disadvantaged students and located in transient or disadvantaged neighborhoods face additional difficulties in establishing the practices and creating a climate to both support student success and to implement interventions to support such success. Although the Institute does not support research on interventions outside the control of the education system, the Institute would support work on the forms of school organization or management that work best in these settings and how these forms can be achieved.

The Institute encourages the development of practical measures of the organizational and management structures of schools and school systems and validation of such measures against student outcomes. Such instruments might enable district leaders to evaluate key strengths and weaknesses of schools and develop plans to address identified weaknesses.

C. Specific Requirements

a. Submission to a specific goal

For the Organization/Management topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Organization/Management topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Organization/Management program:

- Research must address the organization or management of schools or districts that serve students at grade levels from kindergarten through Grade 12.

- Research on measures of the organization and operation of schools or school systems must include validation of the proposed assessment against student academic outcomes (e.g., grades, state achievement test scores, graduation rates).

- All applicants must include measures of student education outcomes (e.g., end-of-course exams, graduation rates, disciplinary actions, scores on state assessments).

The Institute recognizes that there is not always a clear distinction between research that qualifies for the Organization/Management topic and research that fits under the Education Policy, Finance, and Systems topic. As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

12. EDUCATION POLICY, FINANCE, AND SYSTEMS

Program Officer: Dr. David Sweet (202-219-1748; David.Sweet@ed.gov)

A. Purpose

The Institute intends for the Education Policy, Finance, and Systems (Policy/Finance) research program to contribute to improving education outcomes by: (1) exploring malleable factors (e.g., systemic programs and policies) that are associated with better education outcomes (e.g., high school graduation rates, student achievement), as well as mediators and moderators of the relations between these factors and education outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative systemic programs and policies that are intended to improve student outcomes either directly or indirectly by improving the teaching and learning environment; (3) evaluating the efficacy of systemic education programs and policies that are intended to improve student outcomes either directly or indirectly by improving the teaching and learning environment; (4) evaluating the impact of systemic programs and policies that are implemented at scale and are intended to improve student outcomes either directly or indirectly by improving the teaching and learning environment; and (5) developing and testing instruments to measure the impacts of systemic programs and policies or cost accounting tools to link data on student-level resources to student-level achievement data.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, systems-level programs, policies) that have been documented to be effective for improving education outcomes.

B. Background

Improving student achievement and educational attainment (e.g., high school graduation, enrollment in postsecondary education) is a national concern. Through the Policy/Finance program, the Institute supports research to improve student learning and achievement through the implementation of systemic programs and broad policies that affect large numbers of schools within a district, state or the nation. Systemic programs and policies may seek to impact student outcomes by attempting to change the behavior of large numbers of students (e.g., offering material incentives for improved academic and behavioral outcomes). More often, systemic programs and policies work indirectly to impact student outcomes through changing how large numbers of schools or districts carry out instruction and the functions that support or evaluate instruction. For example, district and state curriculum standards and assessments directly impact what is taught, district and state-set requirements for teachers indirectly affect instruction through who is allowed to teach, and district and state programs to improve low-performing schools have both direct and indirect impacts on instruction. Programs and policies may also offer students the opportunity to obtain instruction from alternative sources, for example, supplemental services, non-neighborhood schools including magnets, charters and those in other catchment areas, and virtual schools.

In addition to developing and identifying policies and programs with beneficial impacts on student outcomes, the Policy/Finance program seeks rigorous research on how the implementation or effects of specific systemic strategies might vary by student characteristics (e.g., social and economic background, academic performance) and by school or district characteristics (e.g., experience-level or turnover rate of teaching staff, substantial proportions of high-poverty students). Research is also needed to determine the effects on student learning of making different choices in strategies or investments (e.g., (e.g., mandating smaller class size that will be staffed by less experienced, lower salaried teachers versus larger classes with higher paid, more experienced teachers).

As part of the Policy/Finance research program, the Institute also encourages research to identify ways in which financial resources matter to student learning. For example, how can schools and districts use and allocate resources to improve the performance and capacity of teachers in ways that are tied to student

achievement? In districts that serve high proportions of students from low income families or minority groups, for example, how can incentives be structured to recruit and retain highly qualified and experienced teachers in the schools that serve children with the greatest needs?

The Institute recognizes that applicants to the Policy/Finance research program typically propose models that involve multiple steps. For example, an applicant might choose to evaluate a systemic program intended to reduce chronic absenteeism. The model of change for this program might be:

Intervention		Mediator		Student Academic Outcome
Identify chronically absent students ↓ Conduct graduated intervention: *regular student/advisor meetings *increase monitoring *regular parental contact *assign peer tutor/mentor	→	Increase attendance Increase time in classes Improve student engagement Increase homework completion	→	Improve grades Improve scores Reduce drop-out rates

In this model, improved academic outcomes is the most distal outcome that the intervention seeks to improve. The Institute requires applicants to obtain measures of student academic outcomes (e.g. grades, test scores). In this example, strong applicants would collect measures of moderators (e.g., prior absence levels, prior achievement), as well as the mediators between the intervention strategy and academic outcomes (e.g. increased attendance, increased time in classes).

Under the Measurement goal, the Institute accepts applications to develop and validate cost-accounting tools. Available per-pupil expenditure data may hide disparities among schools when used at the district level and disparities among students when used at the school level (National Research Council 1999). The Institute is interested in practical cost accounting tools or measurement systems that will allow schools and districts to track student-level resources in ways that will enable administrators to make resource allocation decisions that are tied to student learning outcomes. Researchers are encouraged to develop and test new cost accounting tools or measurement systems that will determine the productivity of district and school resource allocations. Proposed systems should take into account the need for an overall cost accounting tool or measurement system that will enable schools and districts to determine student-level resources for educating students with special needs who require additional resources (including, for example, students from racial, ethnic, and linguistic minority groups who have traditionally underachieved academically, and students with disabilities). The Institute encourages researchers to work with large districts or consortia of districts as they develop cost accounting tools to enable administrators to analyze the relations between resource allocation and student achievement.

C. Specific Requirements

a. Submission to a specific goal

For the Policy/Finance topic, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. However, the requirements for Measurement applications that address cost-accounting tools are listed in *Section 12.C.c Requirements for Policy/Finance Measurement goal cost-accounting applications*. Here, specific requirements that apply to applications to the Policy/Finance topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Policy/Finance program:

- Research must address Kindergarten through Grade 12 education policies, finance, or systems and be relevant to the improvement of student education outcomes. Applicants interested in systems-level policies or programs at the prekindergarten level should apply to the Early Learning Programs and Policies topic. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning Programs and Policies topic or to the Policy/Finance topic.

- All applicants must include measures of student education outcomes (e.g., end-of-course exams, graduation rates, disciplinary actions, scores on state assessments).

The Institute recognizes that there is not always a clear distinction between research that qualifies for the Policy/Finance topic and research that fits under the Organization and Management of Schools and Districts topic. As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

c. Requirements for Policy/Finance Measurement goal cost-accounting applications

The requirements described in this section apply only to Policy/Finance Measurement goal applications that address cost-accounting tools.

(i) Requirements of proposed measurement tools

Under the Education Policy, Finance, and Systems topic, applicants may apply to develop and conduct research to validate cost accounting, budgeting, or other measurement tools that will enable education administrators to link student-level resources to student-level learning outcomes for education systems that include kindergarten through high school.

(1) *Rationale*. The Institute is interested in cost accounting methods based on generally accepted accounting principles. The proposal should describe the principles, as well as the theory or rationale supporting the principles, to be used for the allocation of costs or expenditures to student levels. These tools should be able to determine the excess costs of educating students with special needs (e.g., English Learners, students with disabilities) in specific categories of expenditure. These tools should also track the substantive decisions made as well as costs (e.g., what curriculum or type of professional development was purchased not only how much was spent on each) as these are also critical determinants of student outcomes. In addition, applicants should consider the pragmatic constraints (e.g., ease of use, flexibility, cost) that administrators will use to determine whether the system is a reasonable option for general use. Ultimately the goal is to develop a tool that will be practical, usable, and useful for school administrators.

(2) *Components of proposed cost-accounting tool*. Strong applications will include clear descriptions of the components of the proposed cost-accounting tool. When applicants clearly describe the components of the tool, reviewers are better able to judge whether the proposed tool will meet the needs for which it is intended.

(3) *Significance of proposed project*. By describing the theoretical and empirical support for the proposed cost-accounting system, the practical utility of the system, and the components of the system, applicants are addressing aspects of the significance of their proposal.

(ii) Methodological requirements

The proposal must provide a detailed research design and detailed specification of the financial and outcome data that will be used for developing and testing the cost accounting, budgeting, or other measurement tool. The proposed analysis should include student cost estimates in relation to specific instructional programs or resource use patterns and a sensitivity study of how student cost estimates may change for alternative assumptions.

Applicants should detail how they will validate their system. For example, applicants might compare the results of their cost accounting, budgeting, or measurement tool with results obtained from using other cost-effectiveness measurement approaches on data from the same schools or districts. Alternatively, applicants might propose to apply their cost accounting tool to schools or districts that vary in student performance. Researchers might explore productivity and opportunity cost, as well as expenditures.

(iii) Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in (a) education finance; (b) technology related to development of the tool; (c) working with schools; and (d) implementation of, and analysis of results from, the research design that will be employed. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

An applicant may be or may involve *for-profit entities* in the project. Involvement of the commercial developer or distributor must not jeopardize the objectivity of the evaluation.

(iv) Resources

In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and access to schools in which to conduct the research.

(v) Awards

Typical awards under the Measurement goal are $150,000 to $400,000 (total cost = direct + indirect costs) per year for up to four years. Larger budgets will be considered if a compelling case can be made for such support. The size of the award depends on the scope of the project.

13. EARLY LEARNING PROGRAMS AND POLICIES

Program Officer: Dr. Caroline Ebanks (202-219-1410; Caroline.Ebanks@ed.gov)

A. Purpose

Through its Early Learning Programs and Policies (Early Learning) research program, the Institute intends to contribute to improvement of school readiness skills (e.g., pre-reading, language, vocabulary, early science and mathematics knowledge, social skills) of prekindergarten children (i.e., three- to five-year-

olds) by: (1) exploring malleable factors[9] (e.g., children's skills, instructional practices, policies) that are associated with better child outcomes, as well as mediators and moderators of the relations between these factors and child outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative early childhood curricula, instructional practices, programs, and policies for improving school readiness; (3) evaluating fully developed early childhood curricula, instructional practices, programs, and policies for improving school readiness through efficacy or replication trials; (4) evaluating the impact of early childhood curricula, instructional practices, programs, and policies that are implemented at scale; and (5) developing and validating assessments for use in early childhood instructional settings.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, instructional approaches, programs, and policies) that have been documented to be effective for improving school readiness skills for prekindergarten (three- to five-year-old) children in center-based prekindergarten settings.

B. Background

Despite decades of federal, state, and local programs intended to support young children's preparation for schooling, children from low-income families continue to begin formal schooling at a disadvantage. Findings from the Early Childhood Longitudinal Study, a multiyear study following over 22,000 children in the kindergarten class of 1998 through the fifth grade, show that children from families living in poverty had lower reading achievement scores, on average, than students living in households at or above the poverty line. In particular, 61 percent of students living in poverty scored in the lowest third of the distribution of reading achievement scores, compared with 25 percent of students in households at or above the poverty threshold. These differences in reading achievement based on poverty status are evident at the beginning of kindergarten and persist throughout the elementary years (Princiotta, Flanagan, & Germino-Hausken 2006). There is a similar pattern of findings in mathematics. In short, substantial numbers of children from low-income families begin kindergarten behind their more affluent peers, and remain behind throughout their academic careers.

Examining how to improve the school readiness of young children has been a focus of the Institute since 2002 when the Institute launched the Preschool Curriculum Evaluation Research (PCER) program. With PCER funding, researchers evaluated the efficacy of 14 preschool curricula for their impact on school readiness outcomes. *DLM Early Childhood Express supplemented with Open Court Reading Pre-K* showed positive effects on reading, phonological awareness, and language outcomes at the end of prekindergarten and in the follow-up year at the end of kindergarten (Preschool Curriculum Evaluation Research Consortium, 2008). *Pre-K Mathematics with DLM Early Childhood Express Math software* had a positive effect on mathematics outcomes at the end of the prekindergarten year. Both *Curiosity Corner* and the *Early Literacy and Learning Model* showed a positive effect in one domain at the end of the kindergarten year. In addition to the PCER projects, the Institute has funded early childhood research through a number of its other programs (e.g., Cognition and Student Learning, Mathematics and Science, Reading and Writing, the Teacher Quality programs). In 2008, the Institute established the Early Learning Programs and Policies program to be the primary topic under which early childhood research would be funded.[10] Across all of these programs, the Institute has funded approximately 60 research projects that target improving school readiness outcomes of young children. About one third of these projects are focused on developing interventions designed to support children's school readiness skills and the professional development of early childhood educators. Unlike our other program areas, the Institute has supported more efficacy and scale-up evaluation projects of early childhood curricula (28) than projects focused on developing new early childhood interventions.[11] The predominant content area

[9] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

[10] The program was originally called "Early Childhood Programs and Policies."

[11] The 28 early childhood curricula evaluations include efficacy and scale-up projects that were funded under the Read/Write or Math/Science program.

focus of currently funded early childhood research projects is language and literacy skills. However, the Institute has made a substantial investment in developing and evaluating interventions targeting preschoolers' mathematical competence. In addition, the Institute has funded projects that focus on self-regulation, social skills, and behavioral competence, including, for example, efficacy evaluations of curricula such as *Tools of the Mind*. However, the Institute sees a need for additional research in the areas of early science development and development of social and behavioral skills that will enable young children to transition more easily into school.

Although the Institute has funded 4 measurement projects to date, there is a substantial need for reliable, valid, and developmentally appropriate measures for use with young children. Under the Early Learning research program, the Institute especially encourages applications to develop and validate measures of kindergarten readiness that can be easily and reliably administered by practitioners and address the variety of skills necessary for success in kindergarten (e.g., cognitive, language, social and emotional, physical, early literacy, early numeracy). Although school readiness measures exist, typical measures often focus on one domain (e.g., language or literacy) and require intensive professional development to be administered reliably. The Institute is interested in measures that will cover multiple domains, reliably predict school success, and yet be reliably and easily administered by practitioners. The Institute especially solicits applications to develop and/or validate measures that are linked to State early learning guidelines and program quality standards. The Institute encourages applicants to collaborate with States to develop standards-based measures of school readiness outcomes for use in state early childhood accountability systems. The Institute also invites applications to support the development and validation of early childhood screening measures that could be used by parents or early childhood educators (e.g., child care workers, Head Start teachers, prekindergarten teachers) to identify young children who might benefit from intervention services and with early screening might be identified in time to make a difference for kindergarten entry. Such screening measures would not be intended for diagnostic purposes but could identify young children who would need in-depth assessment. Applications that would be appropriate for consideration include, but are not limited to: (a) proposals to develop new assessments; (b) proposals to modify, adapt, or combine existing assessments so that the revised instrument covers multiple domains and is easy for practitioners to use; and (c) proposals to adapt assessments originally designed and used for research purposes for broader use in instructional settings.

In addition to measurement research, the Institute continues to solicit research on curricula, instructional practices, and teacher professional development intended to improve young children's pre-reading, pre-writing, language and vocabulary, early science and mathematics skills, and socio-emotional competence. Socio-emotional competence covers a broad range of knowledge and skills. The Institute encourages research on those skills that are predictive of later school performance. Under the Early Learning program, the Institute also requests applications for rigorous research on early childhood policies and their relation to improving school readiness and other school-related outcomes for young children.

C. Specific Requirements

a. Submission to a specific goal

For the Early Learning research program, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Early Learning topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements
Under the Early Learning program:

- Research must focus on prekindergarten children (ages 3 to 5). For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning program or may choose to submit the application to the appropriate content topic (e.g., English Learners, Read/Write, Math/Science, Teacher Quality-Read/Write).
- Research must address school readiness outcomes, including pre-reading, pre-writing, early mathematics, early science, socio-emotional skills, or physical skills related to school outcomes.
- Research focuses on early childhood interventions and assessments, including assessments of young children, curricula, instructional practices and approaches (including use of technology), teacher professional development, assessments of early childhood teachers, early childhood programs, policies, and assessments of early childhood classrooms and programs.
- All applicants must include measures of children's school readiness outcomes.
- The Institute is primarily interested in early childhood interventions – programs, practices, and policies – intended to improve school readiness for children who are at-risk for later school failure. The focus of the Early Learning program is on center-based programs and policies for prekindergarten children (three- to five-years old).

14. ENGLISH LEARNERS

Program Officer: Dr. Karen Douglas (202-208-3896; Karen.Douglas@ed.gov)

A. Purpose
Through its research program on English Learners (EL), the Institute intends to contribute to improvement of academic achievement in reading, writing, mathematics, or science, as well as other school outcomes (e.g., graduation rates, access to postsecondary education) for students who are English learners by: (1) exploring malleable factors[12] (e.g., children's skills, instructional practices, policies) that are associated with better child outcomes, as well as mediators and moderators of the relations between these factors and child outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative interventions for EL students (e.g., curriculum, instructional practices, programs, and policies) designed to improve outcomes for EL students; (3) evaluating fully developed interventions for EL students through efficacy or replication trials; (4) evaluating the impact of interventions for EL students that are implemented at scale; and (5) developing, revising, and validating assessments for use with EL students.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, instructional approaches, programs, and policies) that have been documented to be effective for improving academic outcomes for EL students.

B. Background
Children who speak a language other than English at home[13] continue to be a rapidly growing segment of the K-12 school-age population in the United States. In the past three decades, the number of these

[12] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

[13] Many different terms have been used to refer to individuals whose home language is one other than English, and these individuals represent a broad spectrum of proficiency in the English language, from "limited English proficient students" (LEP - those making a transition from their home language to English as a new language used in the context of school) to those who are highly proficient in the school language of English. The term "English Learner" is typically used to refer to students who are just beginning to learn English or who have begun to gain some proficiency in English. We use the term English Learners here, and intend the definition to be broad, encompassing all students whose home language is one other than English and who must learn English as a school language in order to achieve academically.

children has increased from 3.8 to 10.8 million, representing 20 percent of the current school-age population in the United States.[14] These "language minority students" – defined here as those who speak a language other than English at home – vary greatly in terms of their proficiency in the English language and in their primary language. The majority (75%) of these children attending public schools speak Spanish at home, with Vietnamese, Hmong, Korean, and Arabic as the next most frequently occurring language groups (Fry 2007). In the 2003-2004 school year, approximately 11 percent of public school students received services for English Learners (ELs) (Hoffman & Sable 2006).

On the 2007 National Assessment of Educational Progress (NAEP), 70 percent of fourth-graders and 70 percent of eighth-graders identified as ELs scored below the basic level in reading. In contrast, among non-EL students, 29 percent of fourth-graders and 24 percent of eighth-graders were below the basic level in reading. The picture for mathematics achievement is similar. On the 2009 NAEP 43 percent of fourth-graders and 72 percent of eighth-graders identified as ELs scored below the basic level in mathematics, compared to 18 percent of non-EL fourth-graders and 27 percent of non-EL eighth-graders.

Through its research program on English Learners, the Institute supports research on the interventions and assessments that are appropriate for use from kindergarten through grade 12. By English learner, the Institute refers to students whose home language is not English and whose English language proficiency hinders their ability to meet expectations for students at their grade level. Appropriate interventions include curricula and instructional approaches, teacher professional development training, and other programs to support academic learning for English learners. The Institute is interested in the development of innovative programs and practices intended to improve EL students' reading, writing, mathematics, and science achievement, as well as programs and practices to improve graduation rates and promote transition to postsecondary education. The Institute will also support research to evaluate the impact of such programs and practices to determine if they actually improve student outcomes. For applicants interested in developing or evaluating interventions, the Institute encourages researchers to consider how the different conditions under which EL students receive their schooling may affect the implementation and impact of various strategies. For example, how does the proportion of EL students within a school or district (e.g., majority to small minority of students) affect feasibility and implementation of interventions? How does the number of different primary languages affect the feasibility of program implementation for EL students? In some areas, EL students primarily represent one language group (e.g., Spanish); in other areas, EL students represent a number of different language groups (e.g., Chinese, Hmong, Spanish, and Vietnamese). The Institute especially solicits applications for research on older EL students in middle or high school, including those students who entered the U.S. school system as adolescents and those students who entered in elementary school but who continue to need services for EL students.

In addition to supporting research on interventions, the Institute encourages researchers to conduct exploratory research to identify malleable factors (e.g., instructional practices, policies, teacher skills) that are associated with better school outcomes (achievement, graduation rates, attendance), as well as mediators and moderators of the relations between these factors and child outcomes, for the purpose of identifying potential targets of intervention.

The Institute also encourages research to develop and/or validate assessments for EL students. Such assessments could be used for screening purposes to distinguish, for example, between students who need different types of support for improving their English skills. Also acceptable are assessments to monitor progress. Applications that would be appropriate for consideration include, but are not limited to: (a) proposals to develop new assessments that teachers could use to inform classroom instruction; (b) proposals to modify or adapt existing assessments so that teachers can use them to inform daily or

[14] The Condition of Education 2008, Indicator 7, accessed from the Institute of Education Sciences website on January 6, 2009 at http://nces.ed.gov/programs/coe/2008/section1/indicator07.asp.

weekly instructional plans for specific students; and (c) proposals to adapt assessments originally designed and used for research purposes for broader use in instructional settings.

C. Specific Requirements

a. Submission to a specific goal

For the EL research program, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the EL topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the EL program:

- Research must focus on EL students from kindergarten through Grade 12. For research that spans early childhood and the early elementary grades, the applicant may choose to submit the application to the Early Learning program or to the English Learners program.
- Research must address either basic academic outcomes in reading, writing, mathematics, or science or general academic outcomes, such as graduation rates, access to postsecondary education, grade retention, and course completion.
- All applicants must include measures of student academic outcomes.
- There are times when an application may fit under the EL topic as well as another topic (e.g., Reading and Writing). As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

15. POSTSECONDARY EDUCATION

Program Officer: Dr. David Sweet (202-219-1748; David.Sweet@ed.gov)

A. Purpose

The Institute intends for the Postsecondary Education research program to contribute to improving access to, persistence in, and completion of postsecondary education by: (1) exploring malleable factors[15] (e.g., programs, practices, policies) that are associated with improving access to, persistence in, or completion of postsecondary education, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative programs, practices, or policies that are intended to improve access to, persistence in, or completion of postsecondary education; (3) evaluating the efficacy of programs, practices, or policies that are intended to improve access to, persistence in, or completion of postsecondary education; (4) providing evidence on the effectiveness of programs, practices, or policies for improving access to, persistence in, or completion of postsecondary education when they are implemented at scale; and (5) developing and/or validating assessments of cognitive (e.g., problem-solving, writing) and social cognitive (e.g., communication and interpersonal) skills that are outcomes of postsecondary education.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, programs, policies) that have been documented to be effective for improving access to, persistence in, or completion of postsecondary education.

[15] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

B. Background

Improving participation and persistence in postsecondary education is a national concern, especially for at-risk students. According to the National Center for Education Statistics, there are substantial gaps across income groups in the percentages of high school graduates who enrolled in college the fall semester after high school graduation: 53 percent of students from low-income families, 58 percent from middle-income families, and 80 percent from upper-income families. Similarly, there are differences across racial and ethnic groups in the percentages of high school graduates who enroll in college right after high school graduation: 66 percent of White students, 58 percent of African American students, and 59 percent of Hispanic students. Moreover, there continue to be gaps across income groups in the proportions of students who graduate from college or persist in college five years after their initial enrollment: 61 percent from low-income families, 65 percent from middle-income families, and 71 percent from upper-income families. Across racial and ethnic groups, the five-year graduation or persistence rate also varies: 55 percent for African American students, 77 percent for Asian/Pacific Islander students, 60 percent for Hispanic students, 59 percent for Native American students, and 66 percent for White students (Horn & Berger 2004).

Through the Postsecondary Education research program, the Institute supports research to improve postsecondary access and completion by identifying programs, practices, and policies that are effective for improving access to or persistence in postsecondary education. Postsecondary institutions, school districts, State education agencies, and other organizations have launched a wide range of programs, practices, and policies to address these issues. Little rigorous research exists to evaluate the impact of these programs. For example, in recent years, a number of innovative programs for improving access to postsecondary education have been implemented. Many school systems offer dual enrollment or "early college" high school programs that allow a wide range of students to earn a high school diploma while progressing toward an associate degree or certificate. Innovative dropout recovery programs such as Diploma Plus, and Portland Community College's Gateway to College program specifically use dual enrollment to reconnect out-of-school youth with a formal education. Institutions of higher education have implemented a variety of programs and practices to improve student retention. Many institutions have courses or workshops that focus on building the skills of under-prepared students (e.g., developmental mathematics courses, study skills courses, workshops designed to improve students' general test-taking or note-taking skills). Research is needed to determine which programs are effective.

In recent years, a number of different types of programs (e.g., parent education, counselors, websites) address students' and parents' access to information about college and planning ahead for college. The Institute encourages research to evaluate the impact of such programs on student enrollment.

The high cost of attending college continues to be an important issue in postsecondary education. According to the College Board, in the 2005-2006 academic year, annual prices for undergraduate tuition, fees, room, and board were estimated to be over $12,000 at four-year public colleges and $29,000 at four-year private colleges; for the same year, undergraduates at two-year public institutions on average spent approximately $2,200 a year for tuition and fees (College Board 2005). The Institute invites applications to examine the complex relations between student financial aid programs (including federal, state, and private sources), and access to and completion of postsecondary education. Because financial aid comes from multiple sources, we encourage research on the interactions of aid programs (e.g., how institutions package available sources of financial aid to eligible students) and their subsequent effects on access to and completion of postsecondary education.

Many colleges and universities have implemented assessments of students' college-level reading, writing, mathematics, and critical thinking skills in order to provide feedback for the improvement of their general education curriculum or for accreditation and accountability purposes. For example, the Measure of Academic Proficiency and Progress by ETS, the Collegiate Learning Assessment by the Council for Aid to Education, and the Collegiate Assessment of Academic Proficiency by ACT are three commercially

available assessments for institutions of higher education. The Institute invites applications to examine the validity and utility of widely used assessments like these. What do these types of assessments predict? What are their effects on institutions and on students? Applications to develop and/or validate such instruments are appropriate for the Measurement goal under this topic.

C. Specific Requirements

a. Submission to a Specific Goal

For the Postsecondary Education Research program, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Postsecondary Education Research topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Postsecondary Education Research program:

- Research must focus on access to, persistence in, or completion of postsecondary education.
- Interventions must be those that are implemented at the high school or postsecondary level that are intended to increase access to postsecondary education, support the transition from high school into postsecondary education, improve the persistence of students in postsecondary education, or the completion of postsecondary education.
- Assessments must be measures of learning at the postsecondary level (e.g., college-level proficiencies in reading, writing, critical thinking, and mathematics) that could be used broadly across institutions of higher education to assess what students have learned in college.

16. ADULT EDUCATION

Program Officer: Dr. Elizabeth Albro (202-219-2148; Elizabeth.Albro@ed.gov)

A. Purpose

Through its Adult Education research program, the Institute intends to contribute to improvement of basic reading, writing, and mathematics skills of adult learners by: (1) exploring malleable factors[16] (e.g., adults' skills, instructional practices, curricula) that are associated with better student outcomes, as well as mediators and moderators of the relations between these factors and student outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative interventions (e.g., curricula, instructional practices, and technology) for improving reading, writing, and mathematics skills of adult learners; (3) evaluating fully developed interventions for improving reading, writing, and mathematics skills of adult learners through efficacy or replication trials; (4) evaluating the impact of interventions that are implemented at scale; and (5) developing and validating assessments for use in adult education settings.

The long-term outcome of this program will be an array of tools and strategies (e.g., assessments, instructional approaches, programs) that have been documented to be effective for improving reading, writing, and mathematics skills of adult learners

[16] By malleable factors, we mean factors that can be changed and are potential targets for intervention.

B. Background

Approximately 30 million American adults, or 14 percent of the adult population, have difficulty reading (Kutner, et al., 2007). Some of these adults struggle to read because they are nonliterate in English, others because they have some, but not all, skills required to read and comprehend connected text. In addition, about 22 percent of the adult population have limited quantitative skills and can only use their knowledge of numbers to perform simple quantitative operations (mostly addition) when the mathematical information is concrete and familiar (Kutner et al., 2007). Adults lacking these basic prose and quantitative literacy skills struggle to succeed in the workplace. Approximately 44 percent of adults who scored below basic in prose literacy on the most recent National Assessment of Adult Literacy have incomes which place them below the poverty threshold (Baer, Kutner, & Sabatini, 2009). The need to improve the skills of adults with limited reading and numeracy skills has been addressed, in part, by the provision of adult education. Of the nearly 2.4 million adults who participated in adult education programs in 2008-2009, approximately 42 percent enrolled in adult basic education, an additional 44 percent participated in English literacy programs, and the remaining 14 percent were enrolled in adult secondary education.[17] Adult learners within each of these program types have widely varying education needs and the effectiveness of adult education programs in providing learners with the literacy and numeracy skills that they need for workforce success is mostly unknown.

Many adults participating in adult basic education (ABE) struggle with basic word level skills, while others are able to comprehend short texts. Some research is beginning to accumulate that addresses these questions with respect to struggling adult readers. A recent analysis of the component skills of struggling adult readers indicates that there is substantial variability across these adult readers (e.g., Strucker, Yamamoto, & Kirsch, 2007), and that the variable patterns of reading skills look distinctly different from the patterns seen in children who are struggling to read (Greenberg, Ehri, & Perin, 2002; Mellard, Fall, & Mark, 2009). In children, a typical developmental pathway to reading includes word recognition becoming an automatic process, and differences in comprehension becoming associated, not with word level skills, but with listening comprehension measures. Struggling adult readers are not showing the expected transition in which comprehension becomes more strongly correlated with listening comprehension and less dependent on word level skills. Researchers have also found that measures of underlying cognitive function (e.g., speed of processing, working memory capacity) contribute indirectly to reading comprehension in struggling adult readers. These findings suggest that theoretical models of reading comprehension that derive from the developmental trajectories of typically developing readers may not apply to these struggling adult readers. Although some research has examined the role of working memory in reading comprehension (e.g., Sabatini, 2002), little research has explored how other cognitive factors, such as executive function and knowledge organization, contribute to the difficulties experienced by struggling adult learners. Virtually no research has applied what has been learned through the cognitive sciences to improving instruction for struggling adult learners in the context of adult education.

A second type of adult education programs are English literacy programs serving adult English learners (EL). Adults in these classes span the continuum from those who are literate in their first language and highly educated to those who have limited literacy and formal education in their first language. Both types of learners seek instruction in English and may be in the same classes. The goal of most of these EL programs is to provide instruction in English, and to rapidly transition these learners to ABE or adult secondary education courses appropriate to their incoming literacy levels. However, a recent review of the literature on EL instruction found a serious shortage of materials focused on the needs of adult EL students, and on appropriate instructional strategies and program organization to support those transitions (Hector-Mason, et al., 2009). Given the large numbers of adult English learners in adult

[17] U.S. Department of Education, Office of Vocational Education, Reports of Aggregate National Reporting System Data. Table: Participants By Entering Educational Functioning Level, Ethnicity, And Sex; Program Year: 2008-2009; All Regions. Downloaded on December 23, 2009 from http://wdcrobcolp01.ed.gov/CFAPPS/OVAE/NRS/reports/index.cfm.

education programs, and their variable instructional needs, it is critically important to identify effective strategies for teaching these learners.

The third major type of adult education program is adult secondary education (ASE). Much research relevant to teaching this population overlaps with postsecondary research and focuses on how best to teach the higher level skills necessary to pass the General Educational Development (GED) exams. However, passing the GED is not entirely congruent with skills needed for postsecondary (or workforce) success. An important line of research with this group of learners would be to consider how to reorganize the content of instruction to make it more aligned with postsecondary skills (e.g., move it beyond test preparation).

Although most research on adult learners has focused on reading, many adults also struggle with quantitative literacy skills. Results from the National Assessment of Adult Literacy, carried out in 2003, find that of adults whose highest level of education is less than high school, 64 percent have quantitative skills that are below basic.[18] At most, these adults are able to locate numbers and use them to perform simple quantitative operations (primarily addition) when the mathematics information is very concrete and familiar. Given the national call for adults with high levels of mathematics skill in the labor market, there is a pressing need for research to guide instruction in mathematics in adult education. A recent review of the literature in adult numeracy (Condelli et al., 2006) indicates that there is "virtually no systematic research in ABE identifying effective mathematics instruction" (pg. 62).

The knowledge base on how to support adult learners most effectively is still nascent. What are the most effective strategies for teaching this diverse group of adult learners? Are there underlying cognitive processes that may contribute to the difficulty these adults have experienced in learning to read and execute basic math operations that must be remediated in order for adults to master these critical skills? Through the Adult Education research program, the Institute will support research intended to improve reading, writing, and mathematics skills of adult learners in adult basic education, adult secondary education, and programs serving adults who are learning English. In addition, through this program, the Institute will support research to improve reading, writing, and mathematics skills of students in developmental (remedial)/bridge programs designed to help under-prepared students acquire the skills to succeed in college.

C. Specific Requirements

a. Submission to a specific goal

For the Adult Education research program, applicants must submit under one of five goals, *either* Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Adult Education topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements

Under the Adult Education research program:

[18] U.S. Department of Education, National Center for Education Statistics, 1992 National Adult Literacy Survey (NALS) and 2003 National Assessment of Adult Literacy (NAAL), *A First Look at the Literacy of America's Adults in the 21st Century*; and supplemental data retrieved July 6, 2006, from http://nces.ed.gov/naal/Excel/2006470_DataTable.xls. (This table was prepared July 2006.)

- Research must focus on basic reading, writing, or mathematics skills of adult learners.
- By adult learners, the Institute means adults who are served through adult basic education, adult secondary education, programs for adults who are learning English, or programs designed to help under-prepared students acquire the skills to succeed in college (e.g., developmental or bridge programs).
- Under the Measurement goal, assessments must be reading, writing, or mathematics assessments appropriate for adult learners.

The Institute recognizes that there is not always a clear distinction between programs for adult learners and programs to support the transition into and persistence in postsecondary education. As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

17. EDUCATION TECHNOLOGY

Program Officer: Dr. Jonathan Levy (202-219-2096; Jonathan.Levy@ed.gov)

A. Purpose

Through its Education Technology research grants program, the Institute intends to support research on education technology tools that are designed to provide or support instruction in reading, writing, mathematics, or science (including pre-reading, pre-writing, early mathematics, and early science) or to provide professional development for teachers related to instruction in reading, writing, mathematics, or science. The Institute intends to contribute to improvement of reading, writing, mathematics, and science learning by (1) developing innovative education technology tools intended to improve reading, writing, mathematics, science, or general study skills; (2) evaluating fully developed education technology tools intended to improve reading, writing, mathematics, science, or general study skills through efficacy or replication trials; (3) evaluating the effectiveness of fully developed education technology tools intended to improve reading, writing, mathematics, science, or general study skills that are implemented at scale; and (4) developing and/or validating assessments that use education technology and that can be used in instructional settings.

The long-term outcome of this program will be an array of education technology tools that have been documented to be effective for improving reading, writing, mathematics, and science achievement.

B. Background

Too many U.S. students are not becoming proficient in basic academic knowledge and skills in reading, writing, mathematics, and science. For example, on the 2007 National Assessment of Educational Progress (NAEP), 33 percent of fourth-graders and 26 percent of eighth-graders cannot read at the basic level; and on the 2005 NAEP 27 percent of twelfth-graders cannot read at the basic level. That is, when reading grade appropriate text these students cannot extract the general meaning or make obvious connections between the text and their own experiences or make simple inferences from the text. In other words, they cannot understand what they have read. A similar picture emerges in the development of writing skills. According to the 2002 NAEP writing assessment 14 percent of fourth-graders cannot write at the basic level, 15 percent of eighth-graders cannot write at the basic level, and 26 percent of twelfth-graders cannot write at the basic level. On the 2003 National Assessment of Adult Literacy, 14 percent of adults demonstrated no more than the most simple and concrete literacy skills. These adults are able to sign their names and can locate information in short prose texts, but are unable to read and understand material presented in pamphlets or newspaper articles. Another 29 percent of the adult population demonstrated basic prose literacy skills, but could not perform moderately challenging literacy activities, such as summarizing a text. Given the increasing need for literacy in the workplace (Barton 2000), it is unsurprising that more than half of adults with below basic literacy levels are unemployed. In

addition, adults with a basic mastery of prose literacy skills also confront challenges in the workplace. Approximately 38 percent of those individuals are currently unemployed.

In mathematics and science, large numbers of U.S. students continue to score below the basic level. In the 2007 NAEP, 18 percent of fourth-graders and 29 percent of eighth-graders scored below the basic level in mathematics. On the 2005 NAEP, the most recent assessment of twelfth-graders, 39 percent of twelfth-graders scored below the basic level. At grade 4 scoring below the basic level means that the student is likely to miss problems such as using a ruler to find the total length of three line segments. At grade 12 scoring below the basic level means that the student is unlikely to be able to solve problems such as finding the perimeter of a figure. In science, on the 2005 NAEP, 32 percent of fourth-graders, 41 percent of eighth-graders, and 46 percent of twelfth-graders scored below the basic level in science. At grade 4, students performing below the basic level are likely to miss problems such using a data table to determine which day has the most daylight. At grade 12, students performing below the basic level are likely to miss problems such as graphing the populations of two species. In mathematics and science, low levels of achievement are more likely among minority groups and students from low-income backgrounds.

The Institute supports research on education technology products that are intended (a) to improve student outcomes in reading, pre-reading, writing, pre-writing, mathematics, or science skills from prekindergarten through high school (e.g., through intelligent tutors, online courses for advanced high school science and mathematics courses); (b) to teach basic reading, writing, mathematics, or study skills at the postsecondary level, including vocational education and adult education; (c) to provide teacher professional development relevant to reading, writing, mathematics, or science from prekindergarten through high school or to basic reading, writing, or mathematics instruction for adults; and (d) to assess student learning. Under the Institute's Education Technology research program, researchers are invited to propose rigorous research projects to develop innovative education technology tools, or evaluate existing education technology products. The Institute also encourages proposals to develop and validate education technology measurement tools to be used for instructional purposes (e.g., progress monitoring). Through the Education Technology program, the Institute is interested in proposals to develop and evaluate new products, as well as proposals to evaluate the effects of existing products (including commercially available products) on student outcomes. The Institute encourages applicants to read its report on the evaluation of education technology products.[19]

Competitive applications will have a strong rationale for the developmental appropriateness of the product's user-interface design for the targeted students as well as a strong theoretical, pedagogical, and empirical justification for the scope and sequence of the content. The Institute strongly encourages applicants interested in applying to this program to assemble research teams that collectively have expertise in the development of advanced technology (e.g., with artificial intelligence capabilities), instructional design, the targeted content domain (e.g., reading, mathematics), and implementation of rigorous experimental and quasi-experimental program evaluations.

C. Specific Requirements

a. Submission to a specific goal

For the Education Technology research program, applicants must submit under one of four goals, *either* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluation *or* Measurement. More details on the requirements for each goal are listed in *Part III Requirements of the Proposed Research*. Here, specific requirements that apply to applications to the Education Technology topic are described.

Applicants should read carefully the requirements for each goal and the examples of appropriate projects under each goal. The Institute strongly encourages potential applicants to contact the relevant program

[19] *Effectiveness of Reading and Mathematics Software Products: Findings from the First Student Cohort* may be downloaded from http://ies.ed.gov/ncee/pubs/20074005/index.asp.

officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content and sample requirements
Under the Education Technology program:

- Applicants must propose education technology that is intended for use in schools or through formal programs operated by schools (e.g., after-school programs, distance learning programs).
- Education technology for *reading, pre-reading, writing, or pre-writing* must target students from prekindergarten through postsecondary. At the postsecondary and adult education levels, proposals must address basic reading or writing skills for adults (e.g., remedial courses for under-prepared college students or adult literacy courses through vocational or adult education programs), or basic English composition courses intended to teach basic writing skills at the college level (e.g., instruction in organization, audience, style, and writing clear prose; proposals to conduct research on education technology for teaching creative writing or literature will not be considered).
- Education technology for *mathematics* must target students at any level from prekindergarten through high school; or must focus on basic mathematics skills for adults in adult education programs, vocational education programs, or developmental (remedial or bridge) programs designed to help under-prepared students acquire the skills to succeed in college.
- Education technology for *science* must target students at any level from prekindergarten through high school.
- Education technology to enhance study skills must target students at any level from prekindergarten through high school, students in programs for under-prepared college students, or students in adult education programs.
- Education technology for *teacher professional development* relevant to reading, pre-reading, writing, pre-writing, mathematics, or science must target teachers or other instructional personnel from prekindergarten through high school. The Institute will also accept proposals for education technology for teacher professional development for teachers or other instructional personnel to teach basic reading, mathematics, writing, and study skills classes to adults through college developmental (remedial or bridge) programs, vocational education, and adult education. Professional development refers to in-service training for current personnel.
- Education technology *assessments* for reading, pre-reading, writing, pre-writing, mathematics, or science must target students at any level from prekindergarten through high school. In addition, the Institute will accept applications to develop and/or validate education technology assessments intended for adults who are learning basic reading, writing, or mathematics skills through adult education programs, vocational education programs, or developmental/bridge programs designed to help under-prepared students acquire the skills to succeed in college.
- All applicants must include measures of student academic outcomes (e.g., reading, mathematics, writing).

18. ANALYSIS OF LONGITUDINAL DATA TO SUPPORT STATE AND LOCAL EDUCATION REFORM

Program Officer: Dr. Allen Ruby (202-219-1591; Allen.Ruby@ed.gov)

A. Purpose

To promote the use of State and district longitudinal data sets for identifying factors associated with better education outcomes, the Institute has created the Analysis of Longitudinal Data to Support State and Local Education Reform research topic (Analysis of Longitudinal Data).

Grants provided under the Analysis of Longitudinal Data topic will support researchers in collaboration with State and local education agencies (SEAs and LEAs) to analyze State or district longitudinal data in order to explore the malleable factors (i.e., factors that can be changed by the education system) that may be associated with better education outcomes (e.g., student achievement, high school graduation rates, postsecondary enrollment and completion), as well as mediators and moderators of the relations between these factors and education outcomes.

The long term outcome of this program will be the identification of malleable factors that can contribute to the development of new education interventions, modification of existing ones, and identification of interventions that may deserve more rigorous evaluation. A second outcome will be an increased use of longitudinal data systems by SEAs and LEAs for decision making and an increased capacity through research collaborations to use them.

B. Background

Longitudinal data systems allow SEAs and LEAs to follow the progress of their students over time as they matriculate through the education system. States and districts can use these data to identify where additional support may be necessary, for example, for students performing below proficiency levels or for schools that are not graduating large numbers of their students.

Longitudinal data can also be used to measure change in student outcomes and identify the factors that may be associated with such change. If these factors can be modified by the school system, they may offer opportunities to improve student outcomes. For example, determining that a certain level of student absences is associated with a large decline in student achievement could support the implementation of an aggressive intervention targeted at students nearing that threshold. Taking this idea further, some districts have developed early warning indicator systems using a combination of such factors as attendance, achievement (grades and or test scores), retention, and disciplinary actions to identify students likely to not complete high school.

Similarly, exploratory analyses that identify education interventions (e.g., changes in instruction, curriculum, or school policies) associated with beneficial changes in student outcomes could justify more rigorous evaluations of those interventions. In addition, identifying other factors that may affect the relationship between a malleable factor and outcomes can provide options for improving interventions.

The Institute has developed several funding mechanisms to support the development of longitudinal data systems and their use by States and districts for education research, evaluation, and policy analysis. Since FY2006, the Institute has run a competitive grants program for SEAs to design, develop, and implement statewide, longitudinal data systems to efficiently and accurately manage, analyze, disaggregate, and use individual student data (see http://nces.ed.gov/Programs/SLDS/index.asp for details). Forty-one States and the District of Columbia have received such grants.

The Institute has funded the National Center for Analysis of Longitudinal Data in Education Research (CALDER) to inform education policy development through the analyses of longitudinal data on individual students and teachers (see http://www.caldercenter.org). In addition, the Institute has established the Evaluation of State and Local Education Programs and Policies grants program (84.305E) to fund evaluations of SEA- or LEA-implemented programs and policies by research teams which include SEA and/or LEA personnel. State and local longitudinal data systems have been a mainstay of these evaluations. Also, analysis of State and local longitudinal data systems can be proposed under many of the topics within the Institute's Education Research Grants (84.305A); however, a State or district role is not required for this work.

With the Analysis of Longitudinal Data topic the Institute intends to provide an additional source of support for researchers to do work with SEAs and LEAs that falls between developing longitudinal data systems and carrying out formal program or policy evaluations with them. This work entails the (a) exploration of the association between education outcomes and malleable factors and (b) examination of factors and conditions that may mediate or moderate the relations between malleable factors and education outcomes. By malleable factors, the Institute means factors that can be changed such as children's behaviors, teachers' practices, education programs, school or district management practices, or education policies. The Institute is interested in those malleable factors that are under the control of the education system. Through examining mediators and moderators the Institute intends for researchers to identify factors accounting for the relationship between a malleable factor and an outcome (how and why the relationship exists) and under what conditions or for which persons the relationship exists. Mediators and moderators often include characteristics of the students, teachers, schools, or districts.

Such work typically has one of three purposes. First, it can explore underlying processes that may be operating to enhance or inhibit learning. If these processes are malleable, their identification can inform the development of interventions under a subsequent Development and Innovation project. Second, it can identify interventions associated with better education outcomes. These interventions become candidates for more rigorous evaluation under an Efficacy and Replication project. Third, this work can identify potential mediators or moderators of education interventions. For example, the relationship between a dropout prevention program and the decline in the dropout rate may be mediated by the number and type of staff assigned to run it and moderated by the type of students taking part. This information can be used to modify an existing intervention or support the development of a new one under a Development and Innovation project.

The Institute realizes that the administrative data typically making up longitudinal data sets may not contain all the information needed for this type of work. For that reason, projects can include additional primary collection of relevant data that can be linked to the data set. Applications including primary data collection can receive somewhat more funding and additional years (see *Part III, Section 19B*).

The Analysis of Longitudinal Data topic is not intended to: (a) support the expansion or further development of data systems, (b) make the data sets more accessible, (c) evaluate the data system itself, or (d) support the meeting of State or federal reporting requirements. Its purpose is to help SEAs and LEAs identify where they need to focus their attention to improve student outcomes and potential ways of doing so. To this end, it seeks to promote the analysis of available longitudinal data systems by partnerships composed of research institutions and SEAs and LEAs.

C. Specific Requirements

a. Submission to a specific goal

For the Analysis of Longitudinal Data topic, applicants must submit under the Exploration goal. More details on the requirements of the Exploration goal are listed in *Part III Requirements of the Proposed Research*.

The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

b. Content, sample and applicant requirements
Under the Analysis of Longitudinal Data topic:

- Research must focus on students in kindergarten through postsecondary education. For this topic, students in postsecondary education refers to students at the undergraduate level or in professional education that can be entered directly after high school (i.e., this topic is not intended to support research on students in graduate programs or professional programs that require an undergraduate degree).
- The research must be based upon a longitudinal database maintained by an SEA or LEA (these can be K-12 agencies or State postsecondary agencies but not an individual postsecondary institution).
- Research must address either basic academic outcomes in reading, writing, mathematics, or science, or general academic outcomes such as grade retention, course completion, high school graduation, access to postsecondary education, and completion of postsecondary education.
- All applications must include the involvement of at least one SEA or LEA and the key research personnel must include at least one State or district person. The SEA or LEA is expected to play a significant role in the development of the research and evidence should be provided of SEA or LEA involvement and investment in the specific research questions to be addressed.
- Applications must include explicit permission from the holder of the longitudinal data for the applicant to use the data for the purpose described in the application. In addition, the application should note whether the applicant already has the data and, if not, when the data will be received.

The Institute recognizes that there are times when an application may fit under the Analysis of Longitudinal Data topic as well as another topic (e.g., Education Policy, Finance, and Systems; or Organization and Management of Schools and Districts). As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

PART III REQUIREMENTS OF THE PROPOSED RESEARCH

19. GENERAL REQUIREMENTS OF THE PROPOSED RESEARCH

A. Basic Requirements

a. Resubmissions

Applicants who intend to revise and resubmit a proposal that was submitted to one of the Institute's previous competitions but that was not funded must indicate on the application form that their FY-2011 proposal is a revised proposal. Their prior reviews will be sent to this year's reviewers along with their proposal. Applicants should indicate the revisions that were made to the proposal on the basis of the prior reviews using no more than 3 pages of Appendix A.

Applicants who have submitted a somewhat similar proposal in the past but are submitting the current proposal as a new proposal must indicate on the application form that their FY-2011 proposal is a new proposal. Applicants should provide a rationale explaining why the current proposal should be considered to be a "new" proposal rather than a "revised" proposal at the beginning of Appendix A using no more than 3 pages. Without such an explanation, if the Institute determines that the current proposal is very similar to a previously unfunded proposal, the Institute may send the reviews of the prior unfunded proposal to this year's reviewers along with the current proposal.

b. Applying to a topic

Applicants must submit their proposal to one of the specific topics described in *Part II Research Grant Topics*. If applicants do not identify the specific topic under which their proposal should be considered, the Institute may reject the proposal as non-compliant with the requirements of this Request for Applications.

The Institute recognizes that there are times when an application may fit under more than one topic. For example, a proposal to develop technology to support the development of writing skills could fit under Education Technology, but also could fit under the Reading and Writing topic. As long as the application meets the specific requirements listed for a research topic, the applicant may choose to submit to that topic.

c. Applying to multiple topics

Applicants may submit proposals to more than one of the Institute's FY-2011 competitions or topics. In addition, within a particular competition or topic, applicants may submit multiple proposals. However, applicants may submit a given proposal only once (i.e., applicants may not submit the same proposal or very similar proposals to multiple topics or to multiple goals in the same topic or to multiple competitions). If the Institute determines prior to panel review that an applicant has submitted the same proposal or very similar proposals to multiple topics within or across competitions and the proposal is judged to be compliant and responsive to the submission rules and requirements described in the Request for Applications, the Institute will select one version of the application to be reviewed by the appropriate scientific review panel. If the Institute determines after panel review that an applicant has submitted the same proposal or very similar proposals to multiple topics within or across competitions and if the proposal is determined to be worthy of funding, the Institute will select the topic under which the proposal will be funded.

Applicants who submit a proposal for the June 24, 2010 deadline may not submit the same or a very similar proposal to the September 16, 2010 deadline.

d. Applying to a particular goal within a topic

For the FY-2011 Education Research Grants Programs, applicants must submit under one of the five research goals: Exploration *or* Development and Innovation *or* Efficacy and Replication *or* Scale-up Evaluations *or* Measurement. Each goal has specific requirements that are described in the following section. *If applicants do not identify the specific goal under which their proposal should be considered on*

the SF-424 Form of the Application Package, the Institute may reject the proposal as non-compliant with the requirements of this Request for Applications.

e. Determining which goal is most appropriate for the proposed project
Applicants should read carefully the purpose and requirements for each goal. The Institute strongly encourages potential applicants to contact the relevant program officer listed in *Section 34* if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

B. Requirements for the Exploration Goal

Because the requirements for Exploration projects are essentially the same across the Institute's standing research grant programs, a generic description is used in the funding announcement. Consequently, the examples provided may not apply to a particular topic.

a. Purpose of Exploration Projects
Through all of its research programs that include the Exploration goal, the Institute is interested in the (a) exploration of the association between education outcomes and malleable factors and (b) examination of factors and conditions that may mediate or moderate the relations between malleable factors and education outcomes.

By malleable factors, the Institute means factors that can be changed such as children's behaviors, teachers' practices, education programs, school or district management practices, or education policies. The Institute is interested in those malleable factors that are under the control of the education system. For example, young children's self-regulation is positively correlated with later academic achievement (Duncan, et al., 2007). Self-regulation is malleable and has the potential to be influenced by interventions that are under the control of the education system (e.g., teacher practices or classroom programs designed to enhance children's self-regulation). On the other hand, welfare policies may be associated with education outcomes and are potentially malleable, but they are not under the control of the education system. Malleable factors such as children's behaviors or teachers' practices are potential targets of interventions; malleable factors can also be education interventions (i.e., interventions can be changed). By intervention, the Institute refers broadly to policies, programs, practices, curricula, or instructional approaches intended to achieve desired education outcomes.

One purpose of Exploration projects is to explore the underlying processes that may be operating to enhance or inhibit learning outcomes. To the extent that such processes are malleable, information about the underlying processes gained from Exploration projects could be used to inform the development of interventions in a subsequent Development and Innovation project.

Exploration of the relations between education outcomes and education interventions can lead to the identification of types of interventions or components of interventions that are associated with better education outcomes. Exploration projects may be used to identify education interventions that are promising because they are statistically associated with better education outcomes. For example, if all schools in a state used one of five elementary mathematics curricula, a secondary data analysis could be conducted to identify which of the five curricula are associated with better mathematics achievement. This information could inform the selection of curricula to be rigorously tested in a subsequent efficacy evaluation under the Efficacy/Replication goal.

Another purpose of Exploration projects is to examine mediators or moderators of education interventions for the purpose of informing the modification of existing education interventions or development of new interventions in a subsequent Development project. For example, children's level of competence on a particular skill may moderate the relation between an education program and education outcomes. Examining moderators of education interventions may help identify the conditions under which

interventions are associated with better outcomes or the subgroups for which a particular intervention is associated with better outcomes.

A variety of methodological approaches are appropriate under the Exploration goal including, but not limited to, original data collection with appropriate statistical analyses and secondary data analyses of existing data sets. Also appropriate are meta-analyses that go beyond a simple identification of the mean effect of interventions and are designed to determine, for example, moderators of the effects, such as breaking out the effects of (a) specific types of intervention within the broad intervention category that is the focus of the meta-analysis (e.g., Graham & Perin, 2007); (b) variations of a particular intervention (e.g., Cepeda et al. 2006); (c) age or grade level subgroups (e.g., Wilson et al. 2003); and (d) the intervention for relevant population subgroups (e.g., Wilson et al. 2003). Meta-analyses of correlational relationships can be used to identify mediators that are most strongly associated with outcomes (e.g., Fan & Chen, 2001; La Paro & Pianta, 2000).[20]

In general, Exploration projects are intended to *generate* hypotheses regarding the causal relations between malleable factors and education outcomes and to contribute to theories of change for education interventions. In contrast, the purpose of Efficacy and Replication and Scale-up Evaluation projects, as described below, is to *test* causal hypotheses about the effects of fully developed interventions on education outcomes. Applicants interested in, for example, secondary data analyses to determine the effect of an intervention (e.g., policy, program, practice) on education outcomes should apply to the Efficacy and Replication goal. Under the Exploration goal, however, the Institute does not intend to fund research to (a) test the efficacy of education interventions, (b) examine non-malleable factors, (c) explore malleable factors or interventions that are not under the control of the education system, or (d) draw conclusions about the efficacy or effectiveness of education interventions.

At the end of an Exploration project to examine underlying processes or to explore mediators and moderators of education interventions, the researcher should be able to use the results to generate a well explicated theory of action that can be used to inform the development or modification of an intervention under the Development and Innovation goal. At the end of an Exploration project to identify promising interventions, the researcher should be able to use the results of their studies to support a subsequent application for an efficacy evaluation of the promising intervention under the Efficacy and Replication goal.

b. Significance of the project

To address the significance of the project, applicants should provide (a) the theoretical and empirical rationale for the study, (b) an explanation of the practical importance of the variables (malleable factors, mediators, moderators) that will be examined, and (c) a compelling rationale justifying the importance of the proposed research. In essence, applicants are advancing an argument to explain why the proposed research project should be funded.

c. Methodological requirements

For all applications, including those submitted under the Exploration goal, the proposed research design must be appropriate for answering the research questions or hypotheses that are posed.

(i) Research questions

Applicants should pose clear, concise hypotheses or research questions.

(ii) Research design

Applicants must provide a detailed research design and show how the proposed design is appropriate for answering the proposed research questions.

[20] For further information, please see W. R. Shadish (1996). Meta-analyses and the exploration of causal mediating processes: A primer of examples, methods, and issues. *Psychological Methods, 1* (1), 47-65.

(iii) Sample

Applicants should define, as completely as possible, the sample to be selected and sampling procedures for the proposed study, including justification for exclusion and inclusion criteria. Where applicable, applicants should describe strategies to increase the likelihood that participants will remain in the study over the course of the study (i.e., reduce attrition in longitudinal studies). Applicants should demonstrate that with the proposed sample they will have sufficient power to address the proposed research questions. If a primary research question focuses on subgroups (e.g., boys, children from low-income families), applicants should show that the proposed sample will include sufficient numbers within the targeted subgroups to address the proposed question.

(iv) Data sources

Applicants proposing secondary data analyses should describe clearly the data set(s) to be used in the investigation including information on sample characteristics, variables to be used, and ability to ensure access to the data set if the applicant does not already have access to it. The data set should be described in sufficient detail so that reviewers will be able to judge whether or not the proposed analyses may be conducted with the data set. If multiple data sets will be linked to conduct analyses, applicants should provide sufficient detail for reviewers to be able to judge the feasibility of the plan. If the applicant does not currently have access to the data sets needed for the study, the applicant should provide sufficient documentation (e.g., letters of agreement) to assure reviewers that access can be obtained and the project can be carried out in a timely fashion. The applicant should describe the primary outcome measures to be used, including their reliability and validity, and the response rate or amount of missing data for these measures. Applicants should provide sufficient information on the construct validity of the proposed measures. For example, if the applicant proposes to use a state data set from which the primary outcome measure will be performance on a reading or mathematics achievement measure, the applicant should detail the standardized measure from which the reading or mathematics scores are derived so that reviewers can judge the adequacy of the measures for addressing the proposed hypotheses or questions.

Applicants proposing meta-analysis should describe clearly the criteria for including or excluding studies and their rationale, the search procedures for ensuring that a high proportion of the eligible published and unpublished studies will be located and retrieved, the coding scheme and procedures that will be used to extract data from the respective studies, and the procedures for ensuring the reliability of the coding. The applicant should demonstrate that sufficient numbers of studies are available to support the meta-analysis and that the relevant information is reported frequently enough and in a form that allows an adequate data set to be constructed. The effect size statistics to be used should be clearly defined along with the associated weighting function, procedures for handling outliers, and any adjustments to be applied (e.g., reliability corrections). The procedures planned for examining and dealing with effect size heterogeneity should be described, especially the approach to be used to conduct moderator analyses. Applicants should indicate the type of statistical models used and provide a rationale for the choice of models.

Applicants may propose an Exploration project in which the primary focus is on the collection and analysis of original data. The applicant should carefully describe the measures (including reliability and validity), procedures proposed for the primary data collection, and the design of the study. If observational data are collected, applicants should describe how the data would be collected (e.g., procedures for maintaining inter-observer reliability), coded, and quantified to allow quantitative analyses predicting the relation between what was observed and the outcomes of interest.

Applicants may also propose to collect original data as a supplement to be used with the analysis of an existing data set in order to answer the question of interest. In such cases, applicants should describe the sample and how the sample is related to or links to the proposed data set,

the measures to be used (including information on the reliability and validity of the proposed instruments), and data collection procedures.

(v) Data analysis

The applicant must include detailed descriptions of data analysis procedures. Because predictor variables relevant to education outcomes (e.g., student, teacher, or district characteristics) often covary, investigators should utilize the most appropriate analytic techniques to isolate the possible effects of variables of interest. Analytic strategies should allow investigators to examine mediators and moderators of programs and practices, as appropriate. The relation between hypotheses, measures, and independent and dependent variables should be well specified. Strong applications will include an explicit discussion of how exclusion from testing, or missing data, will be handled within the statistical analyses. Strong applications will propose an approach for comparing hypotheses or models of relationships among variables and include sensitivity tests to assess the influence of key procedural or analytic decisions on the results.

d. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in the relevant content domain, the methodological expertise required for conducting this proposed study and, if applicable, for working with schools, or other education agencies. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

e. Resources

In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and, if applicable, access to data sets, schools, or other resources necessary to conduct the proposed research.

f. Awards

For applicants proposing to do primarily secondary data analysis or meta-analysis, the maximum duration of the award is 2 years. Typical awards for such projects are $100,000 to $350,000 (total cost = direct + indirect costs) per year.

Applicants proposing to do primary data collection may request up to 4 years, but must justify the need for the number of years requested. Typical awards for such projects are $100,000 to $400,000 (total cost = direct + indirect costs) per year.

In all cases, the size of the award depends on the scope of the project.

C. Requirements for the Development and Innovation Goal

Because the requirements for Development and Innovation projects are essentially the same across the Institute's standing research grant programs, a generic description is used in the funding announcement. Consequently, the examples provided may not apply to a particular topic.

a. Purpose of Development and Innovation (Development/Innovation) Projects

Through all of its research programs that include the Development/Innovation goal, the Institute intends to support development of and innovation in education interventions—curricula, instructional approaches, technology, policies, and programs. The Institute stresses that Development/Innovation applications are about development and *not* about demonstrations of the efficacy of an intervention. Under the Development/Innovation goal, the Institute does *not* support applications that propose to allocate substantial resources for testing the effect of the proposed intervention. For example, under Development/Innovation, the Institute does not intend to support applications in which the researcher

proposes to spend one year developing the intervention and the second and third years testing the effect of the intervention in a significant number of classrooms or schools. Instead, applicants who have an intervention that could be tested for efficacy should apply to the Efficacy/Replication goal.

From the Institute's standpoint, a funded development project would be successful if at the end of the development award, the investigators had a well-specified theory of change for the intervention, a detailed description of what it means for the intervention to be operating as intended, a fully developed version of the proposed intervention, including prototypes of all materials and products necessary for implementation of the intervention in authentic education delivery settings, fidelity measures to assess the implementation of the intervention, data addressing the feasibility of its implementation in an authentic education delivery setting, and pilot data addressing the promise of the intervention for generating beneficial outcomes as designed.

At the end of a Development/Innovation project, researchers should have evidence that the intervention can be successfully implemented in an authentic education delivery setting and evidence of the promise of the intervention for achieving its intended outcomes, which can be used in support of a subsequent application for an Efficacy/Replication proposal. Feasibility of implementation might be addressed, for example, with observational and survey data on the use of the fully developed intervention in a few test sites in authentic education delivery settings like those for which the intervention is intended. Evidence of the promise of the intervention could be addressed by demonstrating that exposure to the intervention is associated with better outcomes compared to the outcomes of students in a comparison group. Evidence of the promise of the intervention could be data indicating that the gains of students receiving the intervention are larger than gains typically accrued over the same period by samples that have not been exposed to the intervention (e.g., samples used to norm standardized assessments). Evidence of the promise of the intervention could also be obtained using single-subject experimental designs (for more information on single-subject experimental designs, see the Institute's Special Education Research Grants [84.324A] Request for Applications, http//ies.ed.gov/funding). For applicants proposing to develop interventions that indirectly improve student outcomes by changing specific practices of teachers or other school personnel (e.g., professional development), applicants are in a stronger position to apply for Efficacy/Replication grants when they can show that (a) the exposure to the intervention is associated with improved practices consistent with the theory of change underlying the intervention and (b) implementation of the specific practices are associated with better student outcomes. However, data demonstrating the relation between the specific practices and better student outcomes could come from another source (e.g., a prior study showing a correlation between the specific practices and student outcomes). The Institute anticipates that investigators with successful development projects would submit proposals to subsequent competitions for Efficacy/Replication awards. The data on feasibility of implementation and pilot data on the promise of positive outcomes to be collected under a Development/Innovation award are intended to help the Institute and its reviewers determine whether it would be appropriate to fund a subsequent proposal to examine the efficacy of the intervention.

b. Significance of the project

Under Development/Innovation, the Institute invites applications to develop new interventions or further develop interventions that are in the early stages of development (e.g., those that do not have an entire program or product ready to evaluate). It is important for applicants to provide a strong rationale to support the development of the proposed intervention. In essence, applicants are answering two questions. First, why is the proposed intervention likely to produce better student outcomes relative to current education practices? Second, what is the overall importance of the proposed project?

By describing (i) the context for the proposed intervention; (ii) the intervention (e.g., features, components), including its theory of change and the theoretical and empirical support for the proposed intervention; (iii) the practical importance of the intervention; and (iv) overall rationale justifying the importance of the project, Development/Innovation applicants are addressing the significance of their proposal.

(i) Context for the proposed intervention

In strong applications, researchers provide context for the proposed intervention by including data on, or reviewing research describing, the attributes of typical existing practices. What is the practical problem that the intervention is intended to address? Understanding the shortcomings of current practice contributes to the rationale for the proposed intervention. In addition, researchers should provide some context for understanding how much of a change the proposed intervention is intended to achieve. For example, suppose a researcher proposes to develop an intervention that is intended to improve student learning over the course of a semester for students who are performing one year below grade-level expectations. The researcher might consider (a) how much learning one would typically expect to occur over an academic year and (b) how much learning one would need each quarter or semester to bring the students up to grade-level expectations by the end of the academic year.

(ii) Intervention, theory of change, and theoretical and empirical rationale

Applicants should clearly describe the intervention and the theory of change for the intervention. For example, how do the features or components of the intervention relate to each other temporally (or operationally), pedagogically, and theoretically (e.g., why A leads to B)? Applicants should provide a strong theoretical and empirical justification for the design and sequencing of the features or components of the intervention. When applicants clearly describe the theory of change that guides the intervention and the specific features making up the intervention, reviewers are better able to evaluate (a) the relation between the intervention and its theoretical and empirical foundation (e.g., is the proposed intervention a reasonable operationalization of the theory?) and (b) the relation between the intervention and the outcome measures (e.g., do the proposed measures tap the constructs that the intervention is intended to address?).

Applicants should explain *why* the proposed intervention is likely to produce substantially better student outcomes relative to current practice. Applicants should contrast the proposed intervention to typical existing practices. A comparison of the proposed intervention with typical practice helps reviewers determine if the proposed intervention has the potential to produce substantially better student outcomes because it is sufficiently different from current practices and has "active ingredients" that appear on the basis of theoretical or empirical reasons to be powerful agents for improving the outcomes of interest.

(iii) Practical importance

In the rationale to support the proposed intervention, applicants should address the *practical* importance of the proposed intervention. For example, when the proposed intervention is fully developed, will it have the potential to improve student outcomes in educationally meaningful increments, if it were implemented over the course of a semester or school year? Would the proposed intervention be both affordable for and easily implemented by schools (e.g., not involve major adjustments to normal school schedules)?

(iv) Rationale justifying the importance of the proposed research

As described in *Sections 18.C.b.i* through *18.C.b.iii*, the applicant should describe and justify the development of the proposed intervention. All of this information lends support to the applicant's argument for the importance of the proposed project. In addition, applicants should provide a compelling rationale explaining why the proposed research is important to fund. In essence, why is this project a good idea?

c. Methodological requirements

For all applications, including those submitted under Development/Innovation, the proposed research design must be appropriate for answering the research questions or hypotheses that are posed.

The primary purpose of Development/Innovation projects is the development of interventions. For Development/Innovation projects, applicants must clearly address the sample, the proposed methods for developing the intervention, methods for testing the feasibility of implementation of the prototype in an authentic education delivery setting, and methods for assessing the promise of the intervention for achieving the desired outcomes in a pilot study.

Strong applications include clear descriptions of the development activities so that reviewers will understand (a) what will be developed, (b) how it will be developed, and (c) when the development will take place. Applicants should describe what they would measure or observe to determine whether the intervention is working as intended when they are testing the feasibility of successive versions of the intervention. A useful by-product of such testing is a set of fidelity of implementation measures that could be used if the intervention were evaluated in an efficacy trial.

(i) Sample

The applicant should define, as completely as possible, the samples and settings that will be used to iteratively develop the intervention, assess the feasibility of the intervention, and assess the promise of the intervention in the pilot study.

(ii) Iterative development process

A major objective of Development/Innovation projects is to refine and improve upon the initial version of the intervention by implementing it (or components of it), observing its functioning, and making necessary adjustments in the design of the intervention so that it functions more as intended. Development requires a systematic process for creating and refining the intervention. Applicants should describe the systematic, iterative development process to be used in the design and refinement of the proposed intervention, and plans for acquiring evidence about the operation of the intervention according to the theory of change that they describe. The number of times a component or intervention is revised, implemented, observed, and revised depends on the complexity of the intervention and its implementation. Applicants should explain (a) how they define "operating as intended" for the proposed intervention; (b) what data they will collect to determine how the intervention (or component) is operating; (c) how they will use the data they collect to revise the intervention; and (d) what criteria they will use to determine if the intervention (or component) operates as intended.

A timeline that delineates the iterative process of drafting and revising the intervention (e.g., features or components of the intervention, procedures, training activities, and materials) is a helpful way of showing reviewers how research activities will feed into subsequent development (refinement) activities. A variety of methodological strategies may be employed during this phase. For Development/Innovation projects, reviewers need to understand the iterative development process to be used in the design and refinement of the proposed intervention.

(iii) Feasibility of implementation

By the end of a Development/Innovation project, investigators should have a fully developed intervention and data that address the feasibility of implementing the intervention in authentic education delivery settings. Feasibility of implementation might be addressed, for example, with evidence demonstrating that the intervention can be implemented with fidelity in a few authentic education delivery settings that represent the type of settings (e.g., classrooms) for which the intervention is intended. Feasibility should be demonstrated on a small sample of users (e.g., teachers, students) who are like those for whom the product is intended and should show that

they can utilize or implement the intervention in the way that the developer intends the intervention to be implemented.

(iv) Pilot study

By the end of a Development/Innovation project, the Institute also expects investigators to have evidence of the promise of the intervention for achieving the intended outcomes. Such data are intended to be used in support of a subsequent proposal to evaluate the effect of the intervention under an Efficacy/Replication grant (see Efficacy/Replication requirements under *Rationale for interventions that are not in wide use*, *Section 18.D.b.iv)*. A number of approaches may be used to assess the promise of the intervention. For example, an applicant might propose a small quasi-experimental study incorporating a comparison group with pretest and posttest data or propose to compare the gains of students receiving the intervention to gains typically accrued over the same period by samples that have not been exposed to the intervention (e.g., samples used to norm standardized assessments). Evidence of the promise of the intervention could also be obtained using single-subject experimental designs.

Applicants proposing to develop interventions (e.g., professional development) that indirectly improve student outcomes by changing specific practices of teachers or other school personnel are in a stronger position to apply for Efficacy/Replication grants when they can show that (a) the exposure to the intervention is associated with improved practices consistent with the theory of change underlying the intervention and (b) implementation of the specific practices are associated with better student outcomes. However, data demonstrating the relation between the specific practices and better student outcomes could come from another source (e.g., a prior study showing a correlation between the specific practices and student outcomes).

Whatever pilot study is proposed, applicants should be aware that no more than 30 percent of the funds may be used to support the collection of pilot data regarding the promise of the fully developed intervention and that the pilot study is *not* intended to be a test of the efficacy of the intervention.

(v) Measures

Applicants should clearly describe procedures for collecting data as well as the measures that will be used (e.g., where appropriate, information on reliability and validity of instruments). Development/Innovation projects typically include the collection of process data to help the researcher refine the intervention and provide insight into the feasibility and usability of the proposed intervention in authentic education delivery settings. Applicants should clearly describe (a) what needs to be observed to determine if the intervention is operating as intended, (b) how those observations will be collected, and (c) how the data will be coded. Observational, survey, or qualitative methodologies are encouraged to identify conditions that hinder implementation of the intervention.

The Institute recognizes that there may be a need for some measurement development to be conducted in Development/Innovation projects (e.g., fidelity measures, measures of outcomes that may be aligned with the proposed intervention). In such cases, applicants should detail how those measures will be developed and validated.

d. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in the relevant content domain, the methodological expertise required for conducting this proposed study, and experience working with schools or other education agencies. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

An applicant may be or may involve *for-profit entities* in the project. Involvement of the commercial developer or distributor must not jeopardize the objectivity of the research.

e. Resources
In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and access to schools in which to conduct the research.

f. Additional Considerations
The Institute expects any developed interventions (whether supported by the Institute or other organization) with promise of potential efficacy to move to an efficacy evaluation. However, there are situations in which researchers may appropriately apply for a second development award to further develop or extend an intervention that was the focus of a previous development project, prior to the intervention being evaluated through an efficacy evaluation. Applicants applying for a second development award to further develop an intervention should (a) justify the need for a second development award, (b) describe the results and outcomes of prior or currently held awards to support the development of the intervention (e.g., evidence that the intervention in its current form shows promise for improving education outcomes), and (c) indicate whether what was developed has been (or is being) evaluated for efficacy (Efficacy/Replication project) and if results are available, what the results of those efficacy evaluations have been. A stronger argument for a second development award to extend or further develop an intervention can be made when the researcher has data showing that the intervention in its current form has strong potential for improving education outcomes.

Applicants who have previously received a development award and are applying for a grant to develop a *new* intervention should indicate whether the first intervention has been evaluated for efficacy (by themselves or another research team) and describe results, if available. Applications from researchers who have previously received an award to develop an intervention are strengthened when the researchers can demonstrate that their previous intervention improves, or shows promise for improving, education outcomes.

g. Awards
Typical awards for projects at this level are $150,000 to $500,000 (total cost = direct + indirect costs) per year. Development/Innovation projects are for a maximum of 3 years. Development costs vary according to the type of intervention that is proposed, therefore larger awards will be considered. In all cases, the size of the award depends on the scope of the project.

Under Development/Innovation, no more than 30 percent of the total funds may be used for collection of pilot data to demonstrate the promise of the intervention for achieving the desired outcomes.

D. Requirements for the Efficacy and Replication Goal

Because the requirements for Efficacy and Replication projects are essentially the same across the Institute's standing research grant programs, a generic description is used in the funding announcement. Consequently, the examples provided may not apply to a particular topic.

Under the Efficacy and Replication (Efficacy/Replication) goal, the Institute requests proposals to test the efficacy of fully developed interventions. By *efficacy*, the Institute means the degree to which an intervention has a net positive impact on the outcomes of interest in relation to the program or practice to which it is being compared.

a. Purpose of Efficacy and Replication (Efficacy/Replication) Projects
Through all of its research programs that include the Efficacy/Replication goal, the Institute intends to fund efficacy trials to determine whether or not fully developed interventions—programs, practices, and

policies—are effective under specified conditions (e.g., urban schools with a high turnover rate among teachers), and with specific types of students (e.g., English learners). Results from efficacy projects have less generalizability than results from scale-up evaluations. The limited generalizability can arise both from the lack of a full range of types of settings and participants in the study, as well as through the intensive involvement of the developers and researchers in the implementation of the intervention. A well-designed efficacy trial provides evidence on whether an intervention *can* work, but not whether it would work if deployed widely.

Under the Efficacy/Replication goal, applicants may propose an efficacy trial to determine if an intervention will work under specific conditions or a replication trial to determine if an intervention shown to produce a net positive impact in one setting will produce a net positive impact under different conditions (e.g., with a different population of students).

The Institute encourages proposals to compare the impact of two (or more) specific interventions, particularly interventions that are based on different theoretical models. In such cases, the purpose might be to compare the efficacy of two well-developed approaches to improving student learning. One advantage to this approach is that, relative to designs in which the comparison group experiences whatever the school or district currently provides (but see the discussion of "business-as-usual" treatments below), the investigator should have better knowledge of the critical components of each intervention and can attempt to create two conditions in which, for example, instruction varies on a number of critical components.

In efficacy trials, researchers assess fidelity of implementation of the intervention and gather data to help explain the level of fidelity of implementation that is attained. This information can help researchers identify the conditions, tools, and procedures that are needed to support the implementation of the intervention and/or understand why the intervention is not implemented with fidelity in authentic education settings. The Institute encourages studies to replicate a prior efficacy evaluation under different conditions. Collecting implementation data during replication trials also helps researchers understand the conditions that support or hinder the implementation of the intervention.

From the Institute's standpoint, a funded Efficacy/Replication project would be *methodologically successful* if at the end of the grant period, the investigators had rigorously evaluated the impact of a clearly specified intervention on relevant student outcomes and under clearly described conditions using a research design that meets (without reservation) the Institute's What Works Clearinghouse standards (http://whatworks.ed.gov), whether or not the intervention is found to improve student outcomes relative to the comparison condition. The Institute would consider methodologically successful projects to be *pragmatically successful* if the rigorous evaluation determined that the intervention has a net positive impact on student outcomes in relation to the program or practice to which it is being compared. The Institute expects all methodologically successful projects to contribute to our theoretical understanding of education processes and procedures and to the advancement of the education sciences.

Finally, under the Efficacy/Replication goal, applicants may also propose to collect follow-up data to existing efficacy trials. Requirements for follow-up studies are detailed in *Section 18.D.d, Efficacy follow-up studies.*

b. Significance of the project

Interventions appropriate for study under the Efficacy/Replication goal are (a) interventions that are already widely used but have not been rigorously evaluated or (b) interventions that are fully developed, have evidence of their feasibility for use in authentic education delivery settings, and empirical evidence of the promise of the intervention but are not yet widely used. Also appropriate for Efficacy/Replication applications are proposals to *replicate* the efficacy of an intervention in a different setting. For instance, in a previous study, the applicant could have demonstrated the efficacy of an intervention in a small

random assignment trial in an urban school district, and a reasonable next step would be to replicate these findings in a rural school district.

By describing (i) the fully developed intervention (e.g., features, components), (ii) the theory of change for the intervention, and (iii) a compelling rationale for evaluating the proposed intervention, Efficacy/Replication applicants are addressing the significance of their proposal.

(i) Interventions are ready to be evaluated

Applicants must have an intervention that is fully developed and ready to be evaluated. Applicants may devote a short period of time (e.g., 6 months) to develop measures and prepare supporting materials or training manuals for the intervention. However, applicants who intend to devote a longer period of time to developing new components or materials for the intervention or new delivery approaches should apply to Development/Innovation. Efficacy/Replication projects are limited to those interventions that are fully developed. Applicants should clearly describe the intervention and provide evidence that it is fully developed and ready for evaluation.

(ii) Theory of change

Applicants should clearly present the theory of change for the intervention by describing the features or components of the intervention and how they relate to each other and to the intended outcomes both temporally (or operationally) and theoretically (e.g., why A leads to B). When applicants clearly describe the model that guides the intervention and the intervention itself (e.g., specific features or components of the intervention), reviewers are better able to evaluate the relation between the intervention and its theoretical and empirical foundation (e.g., is the proposed intervention a reasonable operationalization of the theory?). Reviewers are also better able to evaluate the relation between the intervention and the outcome measures (e.g., do the proposed measures tap the constructs that the intervention is intended to address?). The Institute recognizes, however, that oftentimes widely used interventions (e.g., published curricula) are not based on a formal theory of change. In such cases, applicants should articulate a general theory of change for the proposed intervention in which they describe what the intervention is expected to change that will ultimately result in improved student outcomes. This general theory of change should be sufficient for guiding the design of the evaluation (e.g., identify what needs to be measured).

Some interventions are designed to *directly* affect the teaching and learning environment and indirectly affect student outcomes. In such cases, it is important for applicants to be clear in their theory of change to identify the mediators that the intervention is designed to affect and through which student outcomes are intended to be improved.

Strong applications will also include detailed descriptions of what the comparison group experiences. By clearly describing the intervention and the comparable treatment that the comparison group will receive, reviewers are better able to judge whether the intervention is sufficiently different from what the comparison group receives so that one might reasonably expect a difference in student outcomes. In addition, reviewers are better able to determine if the proposed fidelity measures and observations of the comparison group are sufficiently comprehensive and sensitive to identify and document critical differences between what the intervention and comparison groups receive.

(iii) Rationale for evaluating interventions that are already in wide use

Applicants should provide a compelling rationale that justifies the Institute's investment in the evaluation of the proposed intervention. As justification for the evaluation of an intervention that is already in wide use, the Institute will accept conceptual arguments of the importance of evaluating the intervention because of its relevance to public policy or current education practice

as would be judged by practitioners and policymakers. For example, the intervention may already be widely used but have not been rigorously evaluated (e.g., a commercially distributed program that is used in a number of states, a specific state education policy). To support this argument, applicants might include documentation of the widespread use of the program to justify the proposed efficacy evaluation. By widespread use, the Institute means used across multiple states or in the majority of districts in a single large state or in the majority of schools in two or more large districts. Typically, interventions that fall in this category are commercially produced and distributed. In this section, applicants are, in essence, justifying why the proposed evaluation is important for the Institute to fund.

(iv) Rationale for evaluating interventions that are not in wide use

Applicants should provide a compelling rationale that justifies the Institute's investment in the evaluation of the intervention. Applicants should provide evidence that the intervention can be implemented in authentic education delivery settings—that is, evidence of the feasibility and usability of the intervention in authentic education delivery settings. Applicants should provide a strong argument for the promise of the intervention for improving education outcomes by including, for example, information on (a) the theoretical foundation on which the intervention was developed; (b) the practical problem the intervention is intended to address; (c) empirical evidence on the feasibility of the intervention's implementation, and (d) empirical evidence demonstrating the promise of the intervention for achieving the desired outcomes.

In short, the applicant needs to address the following questions: Why is this intervention likely to produce better student outcomes relative to current practice? What is the *practical* importance of the intervention (or why should education practitioners or policymaker care about the results of the proposed evaluation)? Why is the proposed evaluation important for the Institute to fund?

c. Methodological requirements

For all applications, including those submitted under the Efficacy/Replication goal, the proposed research design must be appropriate for answering the research questions or hypotheses that are posed.

(i) Research questions

Applicants should pose clear, concise hypotheses or research questions.

(ii) Sample

The applicant should define, as completely as possible, the sample to be selected and sampling procedures to be employed for the proposed study, including justification for exclusion and inclusion criteria. Additionally, the applicant should describe strategies to increase the likelihood that participants will remain in the study over the course of the evaluation (i.e., reduce attrition).

(iii) Research design

The applicant must provide a detailed research design. Applicants should describe how potential threats to internal and external validity would be addressed. Studies using random assignment to intervention and comparison conditions have the strongest internal validity for causal conclusions and thus are preferred whenever they are feasible. When a randomized trial is used, the applicant should clearly state the unit of randomization (e.g., students, classroom, teacher, or school); choice of randomizing unit or units should be grounded in a theoretical framework. Applicants should explain the procedures for assignment of groups (e.g., schools) or participants to intervention and comparison conditions.[21]

[21] For additional information on describing procedures for randomization, see the What Works Clearinghouse document, *Evidence Standards for Reviewing Studies* (p. 6), available at http://ies.ed.gov/ncee/wwc/pdf/study_standards_final.pdf.

Applicants may propose a quasi-experiment rather than a randomized trial when randomization is not possible or when the external validity of the quasi-experiment provides valuable information that is not obtainable from a randomized counterpart. Acceptable quasi-experiments will substantially minimize selection bias or allow it to be modeled. Possible approaches include regression-discontinuity designs, use of instrumental variables, or matched comparison groups designs in which equivalence is demonstrated between the intervention and comparison groups at program entry on the variables that are to be measured as program outcomes (e.g., student achievement scores).[22] In all cases in which a quasi-experimental design is proposed, applicants should explicitly address the threats to internal validity that are not addressed convincingly by the design and how conclusions from the research will be tempered in light of these threats.

Efficacy studies can be based solely on secondary data analyses, provided researchers use an appropriate analytical approach for answering causal questions. Applicants proposing to primarily use existing data sets (e.g., state or local student achievement databases) or to incorporate existing data sets in their analyses should explicitly address how exclusion from testing, or missing data, will be handled within the statistical analysis. If multiple data sets will be linked for the proposed analyses, applicants should provide sufficient detail for reviewers to judge the feasibility of the plan.

(iv) Power

Applicants should clearly address the power of the evaluation design to detect a reasonably expected and minimally important effect. When justifying what constitutes a reasonably expected effect, applicants should indicate clearly (e.g., by including the statistical formula) how the effect size was calculated. If a primary research question focuses on subgroups (e.g., boys, children from low-income families), applicants should show that the proposed sample has sufficient power to address the proposed question about specific subgroups.

Many evaluations of education interventions are designed so that clusters or groups of students, rather than individual students, are randomly assigned to intervention and comparison conditions. In such cases, the power of the design depends in part on the degree to which the observations of individuals within groups are correlated with each other on the outcomes of interest. For determining the sample size, applicants need to consider the number of clusters, the number of individuals within clusters, the potential adjustment from covariates, the desired effect, the intraclass correlation (i.e., the variance between clusters relative to the total variance between and within clusters), and the desired power of the design (note, other factors may also affect the determination of sample size, such as using one-tailed vs. two-tailed tests, repeated observations, attrition of participants, etc.).[23] Strong applications will include empirical justification for the intraclass correlation and anticipated effect size used in the power analysis.

(v) Measures

Applicants should justify the appropriateness of the chosen measures. For example, are measures included that will be sensitive to the change in performance that the intervention is intended to bring about? Measures of student outcomes may include researcher developed measures and other measures that are closely aligned with the proposed intervention. However, applicants should also include relevant measures of student outcomes that are of practical

[22] For more information, see Shadish, W. R., Cook, T. D., and Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin Company.

[23] For more information, see Donner, A., & Klar, N. (2000). *Design and Analysis of Cluster Randomization Trials in Health Research.* New York: Oxford University Press; Murray, D. M. (1998). *Design and Analysis of Group-Randomized Trials*. New York: Oxford University Press; W.T. Grant Foundation & University of Michigan, http://sitemaker.umich.edu/group-based/optimal_design_software.

interest to educators and measures that are not overly aligned with the intervention. For example, proposals to evaluate interventions to improve academic outcomes should include measures such as grades, standardized measures of student achievement, or state end-of-course exams. Proposals to evaluate interventions to improve behavioral outcomes should include practical measures of behaviors that are relevant to schools, such as attendance, tardiness, drop-out rates, disciplinary actions, or graduation rates.

The applicant should provide information on the reliability, validity, and appropriateness of the proposed measures. In strong applications, investigators will make clear how the skills or content the intervention is designed to address are captured in the various measures that are proposed.

Some interventions are designed to change directly the teaching and learning environment and indirectly affect student outcomes. In such cases, applicants must provide measures of student outcomes, as well as measures of the key mediators between the intervention and the target student outcomes.

The Institute recognizes that there may be a need for some measurement development to be conducted in Efficacy/Replication projects (e.g., fidelity measures, measures of outcomes that may be aligned with the proposed intervention). In such cases, applicants should detail how those measures will be developed and validated.

If measures (including those of fidelity, below) are to be developed and/or collected by another organization, that organization must be included in the application and the measures and the instruments (e.g., surveys of participants) that will be used must be described, as well as the data collection procedures and the timing of the data collection. It is not acceptable to simply propose that grant funds be used to contract with an unspecified organization to develop and/or collect the measures.

(vi) Fidelity of implementation of the intervention

Applicants should have a clear plan for how the intervention will be implemented in the education settings and what supports are needed to ensure that the intervention will be implemented as intended (e.g., pre-intervention training for school staff who will deliver the intervention, observations of school staff while they deliver the intervention and feedback on their performance by coaches). Applicants should specify how the implementation of the intervention will be documented and measured. Investigators should make clear how the fidelity measures capture the core components of the intervention. In strong applications, investigators will propose methods that permit the identification and assessment of factors associated with the fidelity of implementation (e.g., additional planning time for teachers); such information may provide insight into what supports are needed within schools or districts to successfully implement an intervention with high fidelity. In strong applications, researchers describe how fidelity data will be incorporated into analyses of the impact of the intervention.[24] Applicants should also collect data on the conditions in the school setting that may affect the fidelity of implementation and that can help the researchers understand why an intervention is or is not implemented with high fidelity.

If the applicant is proposing an efficacy study that relies on secondary data analyses of historical data that does not contain fidelity information, the applicant is *not* required to include fidelity data. The applicant should provide an explanation for why data on fidelity of implementation of the intervention will not be included in the project. The Institute recognizes that there may be

[24] See, e.g., Hulleman, C. S., & Cordray, D. S. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Educational Effectiveness, 2*, 88-110.

some proposals that will rely on secondary analyses of administrative data (e.g., state assessment data) and include both historical data and future data (e.g., a comparative interrupted time series design in which the time frame for the data goes from 2002 through 2012). In such cases, it may or may not be reasonable for the applicant to collect additional data on fidelity of implementation of the intervention. As with all methodological issues, applicants should provide a clear rationale for the decisions they make regarding the proposed research approach.

(vii) Comparison group, where applicable

Comparisons of interventions against other conditions are only meaningful to the extent that one can tell what the comparison group receives or experiences. Applicants should compare intervention and comparison groups on the implementation of critical features of the intervention so that, for example, if there is no observed difference between intervention and comparison student outcomes, they can determine if key elements of the intervention were also provided in the comparison condition (i.e., a lack of distinction between the intervention treatment and the comparison treatment).

In evaluations of education interventions, individuals in the comparison group typically receive some kind of treatment; rarely is the comparison group a "no-treatment" control. For some evaluations, the primary question is whether the intervention treatment is more effective than a particular alternative treatment. In such instances, the comparison group receives a well-defined treatment that is usually an important comparison to the target intervention for theoretical or pragmatic reasons. In other cases, the primary question is whether the intervention treatment is more effective than what is generally available and utilized in schools. In such cases, the comparison group might receive what is sometimes called "business-as-usual." That is, the comparison group receives whatever the school or district is currently using or doing in a particular area. Business-as-usual generally refers to situations in which the standard or frequent practice across the district or region is a relatively undefined education treatment. However, business-as-usual may also refer to situations in which a branded intervention (e.g., a published curriculum or program) is implemented with no more support from the developers of the program than would be available under normal conditions. In either case, *using a business-as-usual comparison group is acceptable.* When business-as-usual is one or another branded intervention, applicants should specify the treatment or treatments received in the comparison group. In all cases, applicants should account for the ways in which what happens in the comparison group is important to understanding the net impact of the intervention treatment. As noted in the preceding paragraph, in strong applications, investigators propose strategies and measures for comparing the intervention and comparison groups on key features of the intervention treatment. The purpose here is to obtain information useful for *post hoc* explanations of why the intervention treatment does or does not improve student learning relative to the counterfactual.

The applicant should describe strategies they intend to use to avoid contamination between treatment and comparison groups. Applicants do *not* necessarily need to randomize at the school level to avoid contamination between groups. Applicants should explain and justify their strategies for reducing contamination.

(viii) Mediating and moderating variables

In efficacy studies, researchers should examine relevant mediating and moderating factors. Observational, survey, or qualitative methodologies are encouraged as a complement to experimental methodologies to assist in the identification of factors that may explain the effect or lack of effect of the intervention. Mediating and moderating variables that are measured in the intervention condition that are also likely to affect outcomes in the comparison condition should

be measured in the comparison condition (e.g., student time-on-task, teacher experience/time in position).

The evaluation should be designed to account for sources of variation in outcomes across settings (i.e., to account for what might otherwise be part of the error variance). Applicants should provide a theoretical rationale to justify the inclusion (or exclusion) of factors/variables in the design of the evaluation that have been found to affect the success of education programs (e.g., teacher experience, fidelity of implementation, characteristics of the student population). Efficacy and replication evaluations should demonstrate the conditions and critical variables that affect the success of a given intervention (e.g., what conditions support or hinder good implementation of the intervention). The most scalable interventions are those that can produce the desired effects across a range of education contexts.

(ix) Data analysis

All proposals must include detailed descriptions of data analysis procedures. For quantitative data, specific statistical procedures should be described. The relation between hypotheses, measures, and independent and dependent variables should be clear. For qualitative data, the specific methods used to index, summarize, and interpret data should be delineated. In strong applications, researchers describe how questions or hypotheses related to mediators, moderators, subgroups, and fidelity of implementation will be addressed in the data analyses.

Most evaluations of education interventions involve clustering of students in classes and schools and require the effects of such clustering to be accounted for in the analyses, even when individuals are randomly assigned to condition. Such circumstances generally require specialized multilevel statistical analyses. Strong applications will provide sufficient detail for reviewers to judge the appropriateness of the data analysis strategy. For random assignment studies, applicants need to be aware that typically the primary unit of analysis is the unit of random assignment.

d. Efficacy follow-up studies

The Institute will support two types of follow-up studies of well-conducted efficacy studies that show robust effects on intended outcomes. Follow-up studies examine the sustainability of the impacts of the intervention after the original project has ended on either (a) students who received the intervention and have moved on (e.g., have entered a new grade) or (b) a new group of students who are now entering the grade or place where the intervention took place. Under the first type of follow-up study students who took part in the original study are followed through additional grades (or places) in which they do not continue to receive the intervention in order to determine if positive effects are maintained in succeeding years. For example, if an efficacy study shows that students in the intervention group do substantially better on third grade reading achievement tests relative to students in the comparison group, researchers could propose to follow those students to determine if the advantage is maintained through elementary school. The Institute will also support a second type of follow-up study that examines the sustainability of the intervention's impacts after the additional resources provided by the original study are withdrawn. Consider, for example, a teacher professional development intervention to improve reading instruction of third grade teachers that was found to produce the desired changes in teachers' behaviors and in student outcomes during the original study. For a follow-up study, researchers could propose to follow the teachers and evaluate whether the treatment teachers continue to engage in the desired practices the year after the professional development intervention ended and whether the students in their new class outperform students of teachers in the comparison group.

(i) Significance of efficacy follow-up studies

To address the significance of the project, applicants should first clearly describe the existing efficacy study, including the sample, the design, measures, fidelity of implementation of the intervention, and analyses. Reviewers need sufficient information to assess how well the efficacy

study was conducted. It is helpful if applicants include a CONSORT flow diagram showing numbers of participants at each stage of the study.[25] Applicants should discuss the participant attrition identified in the flow diagram, the level of attrition expected in the follow-up study and ways it might be reduced, how the analysis will address attrition, and its impact on the interpretation of the results. Second, all applicants should clearly describe the impact of the intervention on all the outcomes measured in the original study, including the impact of the intervention on student outcomes. The Institute intends to support follow-up studies of interventions that produce robust effects. Applicants should provide a compelling rationale justifying the importance of the proposed research.

(ii) Methodological requirements for efficacy follow-up studies

Applicants should pose clear, concise hypotheses and research questions. Applicants should provide a detailed research design and show how the proposed design is appropriate for answering the proposed research questions. Applicants should describe the sample and strategies to minimize attrition of participants over the course of the study. Applicants should describe what measures will be collected and the procedures for collecting the data. If the applicant is proposing a study regarding the continued implementation of the intervention after the efficacy project has ended, the applicant should describe how fidelity of implementation will be monitored. Applicants must include a detailed data analysis plan and demonstrate that they will have sufficient power to conduct the proposed analyses.

e. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in the relevant content domain, the methodological expertise required for conducting this proposed study, and experience working with schools or other education agencies. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

For Efficacy/Replication projects, an applicant may be or may involve developers or distributors (including *for-profit entities*) in the project, from having them as full partners in its proposal to using off-the-shelf training materials without involvement of the developer or distributor. In education efficacy trials, a researcher who develops an intervention is often the Principal Investigator of an efficacy evaluation of the intervention. The Institute allows a researcher/developer to be the Principal Investigator of an efficacy evaluation provided that reasonable steps are taken to ensure the objectivity of the evaluation. Any number of approaches may be taken to ensure the integrity of the research. For example, the researcher/developer could have the randomization process done independently or have the data analysis conducted by researchers who are not part of their research group. In some cases, it may be possible to have child outcomes collected or coded by individuals blind to hypotheses of the project; in many cases, this will not be possible. The Institute recognizes that the education research enterprise does not have sufficient numbers of independent evaluators to conduct all of the efficacy projects that the Institute funds. Consequently the Institute does not require efficacy studies to be conducted independently from the developer of the intervention.

[25] CONSORT, which stands for Consolidated Standards of Reporting Trials, was developed to provide guidance on the tracking and reporting of critical aspects of randomized controlled trials (RCTs). The main initiative of the CONSORT group was the development of a set of recommendations for reporting RCTs, called the CONSORT Statement. The Statement includes a checklist, which focuses on study design, analysis, and interpretation of the results, and a flow diagram (http://www.consort-statement.org/consort-statement/flow-diagram/), which provides a structure for tracking participants at each study stage. IES encourages researchers to use these tools in their Efficacy/Replication and Scale-up Evaluation research projects. Information may be found at http://www.consort-statement.org/.

f. Resources
In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and access to schools in which to conduct the research. Strong applications will document the availability and cooperation of the schools or other education delivery settings that will be required to carry out the research proposed in the application via a letter of support from the education organization.

g. Awards
Typical awards for efficacy and replication evaluations are $250,000 to $750,000 (total cost = direct + indirect costs) per year for a maximum of 4 years. Larger budgets will be considered if a compelling case can be made for such support.

Typical awards for follow up studies are $150,000 to $400,000 (total cost = direct + indirect costs) per year for a maximum of 3 years. Larger budgets will be considered if a compelling case can be made for such support.

In all cases, the size of the award depends on the scope of the project.

E. Requirements for the Scale-Up Evaluation Goal

Because the requirements for the Scale-up Evaluation goal are essentially the same across the Institute's standing education research grant programs, a generic description is used in the funding announcement. Consequently, the examples provided may not apply to a particular topic.

a. Purpose of Scale-up Evaluation Projects
Through all of its research programs that include the Scale-up Evaluation goal, the Institute intends to support scale-up evaluations of interventions — programs, practices, and policies — to determine whether or not fully developed interventions are effective when they are implemented under conditions that would be typical if a school district or other education delivery setting were to implement them (i.e., routine practice; implementation without special support from the developer or the research team) across a variety of conditions (e.g., different student populations, different types of schools). The key differences between Scale-up evaluations and Efficacy/Replication evaluations, as the Institute uses these terms, have to do with the delivery of the intervention and the diversity of the sample. Scale-up evaluations require that the intervention be implemented under conditions of routine practice. That is, the researchers should not be heavily involved in making the intervention work. *The intervention should be implemented in the school or other authentic education setting, as it would be if the school, or entity, had purchased and implemented the intervention on its own without any involvement in a research study.* Second, Scale-up evaluations require sufficient diversity in the sample of schools, classrooms, or students to ensure appropriate generalizability. Scale-up evaluations typically require a larger sample than an Efficacy/Replication evaluation. For Scale-up evaluations, the primary question of interest is, "Does this intervention produce a net positive increase in student learning and achievement relative to the comparison group *under typical conditions?*" As is true for Efficacy/Replication studies, for Scale-up studies, depending on the research question of interest, the comparison group may receive a well-defined alternative treatment, or may receive whatever programs and practices are already currently available and utilized by schools (business-as-usual comparison group). Finally, the Institute invests in Scale-up evaluations for interventions that have *strong prior evidence* of the efficacy of the intervention.

b. Significance of the project

To be considered for Scale-up awards, applicants must propose to evaluate a fully developed intervention that has strong evidence of efficacy when implemented on a limited scale.[26] By (i) clearly describing the intervention, (ii) providing strong evidence of the educationally meaningful effects that are expected, (iii) describing the intervention's theory of change, (iv) detailing the conditions under which the intervention will be implemented, and (v) providing a compelling rationale for the importance of the proposed project, Scale-up applicants are addressing the significance of their project.

(i) Description of the intervention

All applicants should clearly describe the intervention (e.g., features, components). When applicants clearly describe the intervention, reviewers are better able to evaluate the relation between the intervention and the outcome measures (e.g., do the proposed measures tap the constructs that the intervention is intended to address?). Strong applications will also include detailed descriptions of what the comparison group experiences. By clearly describing the components of the intervention and the comparable treatment that the comparison group will receive, reviewers are better able to judge whether (a) the intervention is sufficiently different from the comparison treatment so that one might reasonably expect a difference in student outcomes, and (b) fidelity measures and observations of the comparison group are sufficiently comprehensive and sensitive to identify and document critical differences between the intervention and comparison conditions.

(ii) Strong evidence of educationally meaningful effects

Applicants should provide strong evidence of the efficacy of the program as implemented on a small scale to justify the proposal to conduct a large-scale evaluation of the effectiveness of the intervention. As an example of strong evidence of efficacy, an applicant might describe the results of two or more small scale, rigorously conducted evaluations using random assignment to intervention and comparison conditions in which the efficacy of the intervention is demonstrated with different populations (e.g., urban and rural school districts). Alternatively, a single efficacy evaluation might have involved schools from more than one district and included a diverse population of teachers and students and alone could constitute sufficient evidence of the efficacy of the intervention. Evidence of the efficacy of the intervention should be based on the results of rigorous randomized field trials, or well-designed quasi-experimental evaluations. To enable reviewers to judge the quality of the efficacy studies, applicants should clearly describe the research design and methodology of the efficacy studies, as well as the results of the studies.

Strong applications will include information on the size and statistical significance of the effects that were obtained through efficacy trials. Effect sizes and confidence limits should typically be calculated based on a unit of analysis that is the same as the unit of random assignment. For example, the results of an efficacy trial in which classrooms were assigned to conditions should be analyzed based on classroom means rather than results from individual students. Applicants should indicate clearly (e.g., including the statistical formula) how the effect size was calculated when they use effect sizes as part of the rationale for justifying their intervention. Furthermore, information on effect sizes is more useful to reviewers when sufficient context for interpreting the effect sizes is provided.

(iii) Theory of change

Applicants should clearly present the theory of change for the intervention by describing the features or components of the intervention and how they relate to each other and to the intended outcomes both temporally (or operationally) and theoretically (e.g., why A leads to B).

[26] Applicants proposing to evaluate a widely used intervention for which there is little evidence of the efficacy of the intervention should refer to the Efficacy/ Replication goal. The Institute encourages applicants to discuss the appropriate goal for a proposal with the cognizant program officer listed in *Section 34*.

When applicants clearly describe the model that guides the intervention and the intervention itself (e.g., specific features or components of the intervention), reviewers are better able to evaluate the relation between the intervention and the outcome measures (e.g., do the proposed measures tap the constructs that the intervention is intended to address?), to assess the proposed measures of the fidelity of the intervention, and to assess the degree to which the applicant has included measures of key mediators and moderators of the intervention.

(iv) Conditions of implementation

One objective of scale-up evaluations of interventions is to determine if programs are effective when the developers of the program do not provide any more support than would be available under normal conditions. That is, the program should be implemented as it would be if the schools or other entities that are delivering the program were to obtain the program on their own and decide to use it apart from participation in any research and evaluation study – conditions of routine practice. A second goal is to determine if programs implemented under these conditions are effective in a variety of settings. Interventions that are effective at scale are those that can produce the desired effects across a range of education contexts. For Scale-up studies, the applicant should detail the conditions under which the intervention will be implemented—including explicitly detailing what involvement the researcher/developer will have in the implementation of the intervention and justifying this level of involvement—and include a method to document conditions and critical variables that affect the success of a given intervention.

The size of effects obtained when interventions are implemented under conditions of routine practice is typically smaller than effects obtained in efficacy trials. In strong applications, researchers provide evidence that the intervention can be implemented with adequate fidelity under conditions of routine practice. The materials, training procedures, organizational arrangements, and all other aspects of the intervention should be developed to the point where the intervention is ready to be implemented under real-world circumstances in a real-world way. Strong applications will provide reviewers with sufficient information to evaluate whether the tools and procedures exist that will enable schools or districts to achieve, monitor, and maintain adequate fidelity of implementation of the intervention under conditions of routine practice (i.e., without any support from the researchers or developers of the intervention that would not typically be available to entities wanting to implement the intervention outside of a research study).

(v) Importance of the proposed project

Applicants should provide a succinct but compelling rationale explaining why the proposed research is important to fund. In essence, why is this project important for the Institute to fund?

c. Methodological requirements

For all applications, including those submitted under Scale-up Evaluation, the proposed research design must be appropriate for answering the research questions or hypotheses that are posed.

All of the methodological requirements listed under the Efficacy goal apply to Scale-up goal projects. However, the Scale-up goal does *not* allow scale-up studies based solely on secondary data analyses.

In addition to the Efficacy/Replication goal methodological requirements, strong applications for Scale-up projects will include a Cost-Feasibility analysis to assess the financial costs of program implementation and assist schools in understanding whether implementation of the program is practicable given their available resources. Data should be collected on the monetary expenditures for the resources that are required to implement the program. Financial costs for personnel, facilities, equipment, materials, and other relevant inputs should be included. Annual costs should be assessed to adequately reflect expenditures across the lifespan of the program. The Institute is not asking applicants to conduct an

economic evaluation of the program (e.g., cost-benefit, cost-utility, or cost-effectiveness analyses), although applicants may propose such evaluation activities if desired.[27]

d. Scale-up follow-up studies

The Institute will support the follow-up studies of well-conducted Scale-up studies that show robust effects on intended outcomes. The requirements for Scale-up follow-up studies are the same as the requirements for Efficacy follow-up studies. The first type of follow-up study is one in which students who took part in the original study are followed to determine if positive effects are maintained in succeeding years. For example, if a scale-up study shows that students in the intervention group do substantially better on third grade reading achievement tests relative to students in the comparison group, researchers could propose to follow those students in later grades to determine if the advantage is maintained. The Institute will also support a follow-up study to determine whether the intervention continues, continues with the same intensity, and has similar impacts on the next cohort of students receiving it after the original Scale-Up study has ended. For example, once the Scale-Up study has ended, researchers could determine whether: (a) the districts and schools continue using the tools and processes to support implementation of the intervention, (b) implementation of the intervention changes, and (c) changes occur in the intervention's impact on the proximal and distal outcomes.

e. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in the relevant content domain, the methodological expertise required for conducting this proposed study, and experience working with schools or other education agencies. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

An applicant may involve developers or distributors (*including for-profit entities*) of the intervention in the project, from having the developers as full partners in its proposal to using off-the-shelf teacher training materials without involvement of the developer or publisher. However, involvement of the developer or distributor must not jeopardize the objectivity of the evaluation. Strong applications will carefully describe the role, if any, of the developer/distributor in the intervention. Developers may not provide any training or support for the implementation that is not normally available to users of the intervention. Applicants should describe how objectivity in the evaluation would be maintained. Strong applications will assign responsibility for random assignment to condition, data collection, and data analyses to individuals who were *not* involved in the development of the intervention and are not involved in the distribution of the intervention. Also, in strong Scale-up applications, the role of Principal Investigator is assigned to someone other than individuals involved in the development or distribution of the intervention.

f. Resources

In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and access to schools in which to conduct the research. Strong applications will document the availability and cooperation of the schools or other education delivery settings that will be required to carry out the research proposed in the application via a letter of support from the education organization.

g. Awards

The scope of Scale-up Evaluation projects may vary. A smaller project might involve several schools within a large urban school district in which student populations vary in terms of SES, race, and ethnicity. A larger project might involve large numbers of students in several school districts in different geographical areas.

[27] For additional information on how to calculate the costs of a program or conduct an economic evaluation, applicants might refer to Levin, H.M., & McEwan, P.J. (2001). *Cost-Effectiveness Analysis*. 2nd Ed. Thousand Oaks, CA: Sage Publications.

Typical awards for Scale-up Evaluation projects are $500,000 to $1,200,000 (total cost = direct + indirect costs) per year for a maximum of 5 years. Larger budgets will be considered if a compelling case can be made for such support.

Typical awards for follow-up studies are $250,000 to $600,000 (total cost = direct + indirect costs) per year for a maximum of 3 years. Larger budgets will be considered if a compelling case can be made for such support.

In all cases, the size of the award depends on the scope of the project.

F. Requirements for the Measurement Goal

The Institute's requirements for Measurement projects are the same for all standing education research programs and are described in this section.

a. Purpose of Measurement Projects

Applications appropriate for consideration under the Measurement goal are (a) proposals to develop and validate new assessments; (b) proposals to validate existing assessments; (c) proposals to adapt and validate assessments originally designed and used for research purposes for broader use in instructional settings; (d) proposals to develop and test new techniques for assessment or analysis of assessment data in the context of state accountability standards and systems; and (e) proposals to develop assessments used to certify or assess education professionals (e.g., teachers, education leaders, related service providers) and validate these assessments or existing assessments against student outcomes. Proposed assessments must meet the specific requirements detailed under the topic to which the proposal is submitted.

Measurement development and refinement activities can be supported as part of projects submitted under the other goals (e.g., development of fidelity instruments or development of an outcome measure that is aligned with the intervention). Applications to the Measurement goal are for research that focuses primarily on assessment development and validation.

Under the Measurement goal, the Institute does *not* accept applications to test whether or not the use of an assessment affects student outcomes. Applicants, for example, who are interested in testing whether or not using a progress-monitoring instrument improves student learning must apply under Efficacy/Replication or Scale-up Evaluation. In all cases, the Institute encourages interested researchers to contact the relevant program officer for guidance on the appropriate goal for a particular application.

Under the Measurement goal, the Institute primarily supports research on assessments intended for use in education delivery settings for purposes such as, screening, progress monitoring, outcome assessment, assessment of teachers and other education professionals, and assessment of education systems. However, the Institute recognizes that there are circumstances in which an instrument needs to be developed that will primarily be used by researchers whose translational research will ultimately lead to improvements in education practices. The Institute will accept applications to develop and validate such assessments.

b. Significance of the project

By describing (a) the theoretical and empirical rationale for the proposed assessment, (b) the components of the assessment, and (c) the overall importance of the proposed research, applicants are addressing the significance of their proposal.

(i) Theoretical and empirical rationale

Applicants should provide a compelling rationale to support the development, refinement, and/or validation of the proposed assessment for a given purpose and population. Applicants should clearly describe the theoretical basis for the construct(s) that are intended to be measured by the assessment. Reviewers will consider (a) the strength of the theoretical foundation for the proposed assessment, (b) the existing empirical evidence supporting the proposed assessment, and (c) the practical need for the proposed work (e.g., whether the proposed assessment duplicates existing assessments). In developing or refining an assessment, researchers should keep in mind the pragmatic constraints (e.g., number of students, limited class time, time required to train teachers to use the assessments, costs) that teachers and administrators will consider to determine whether the instrument is a viable option for use in classrooms and other education delivery settings.

(ii) Description of the assessment

Applications should provide sufficient description of the proposed assessment and how it will be used for reviewers to judge the practicality of the proposed assessment. Applicants should describe the components of the assessment (e.g., specific knowledge and skills that the instrument is designed to tap) in sufficient detail to allow reviewers to evaluate relations between the theoretical and empirical foundations for the assessment and the assessment itself (e.g., does the proposed assessment capture critical skills?), and whether the proposed assessment will meet the needs for which it is intended. Applications to examine the use of assessments for accountability purposes should provide sufficient description of the proposed assessment instrument or technique in the context of state and federal accountability policies so that reviewers are able to judge the merits and feasibility of the proposed research on assessment for accountability.

(iii) Overall importance of the proposed research

All applicants should address the practical need for the proposed work (e.g., whether the proposed assessment duplicates existing assessments). For assessments that are intended to be used by practitioners, researchers should explain how the proposed assessment takes into account the pragmatic constraints (e.g., number of students, limited class time, time required to train teachers to use the assessments, costs) that teachers and administrators will consider to determine whether the instrument is a viable option for use in classrooms and other education delivery settings. Applicants proposing research on an assessment that will primarily be used by researchers should provide a strong argument that explains how research using the assessment would ultimately lead to improvements in education.

All applicants should provide a compelling justification arguing the overall importance of the proposed research. In essence, why is this research important to fund?

c. Methodological requirements

For all applications, including those submitted under the Measurement goal, the proposed research design must be appropriate for answering the research questions or hypotheses that are posed.

Applicants proposing to develop a new assessment or refine an existing assessment should clearly address (a) the proposed methods for developing or refining the assessment, and (b) the proposed research methods for obtaining evidence to support the *validity and reliability* of the instrument for the specified purpose(s). Applicants proposing to validate an existing assessment without refining or modifying the assessment should clearly describe the proposed research methods for obtaining evidence of the *validity and reliability* of the instrument for the specified purpose(s).

Applicants should detail the proposed framework and procedures for developing the assessment and provide a clear rationale for the design of the project. The framework provides detailed operational

definitions of the construct(s) of measurement, summarizes how the assessment will provide evidence of the construct(s) identified in the rationale, and describes the processes for reasoning from assessment items and scores to make intended inferences regarding the construct(s) of measurement. To enable reviewers to better understand the proposed framework for the assessment, applicants should make clear the purpose(s) for which the assessment results are likely to be used and how the results are likely to be interpreted. Validity arguments and techniques for estimating reliability should be clearly articulated. Strong applications will include descriptions of (a) the procedures for determining adequate representation of the construct(s) that will be measured by the instrument; (b) the procedures for developing and selecting items to be used in the assessment, including assessing difficulty of selected items, and obtaining representative responses to items for overall score and subscores (if applicable); (c) procedures for scoring the assessment, including processes for maximizing the reliability of scoring for open response items; (d) procedures for minimizing the influence of factors that are extraneous to the intended construct(s) (i.e., construct irrelevance); (e) if alternate forms will be developed, the procedures for establishing the equivalency of the forms (i.e., horizontal equating); (f) if the proposed assessment is used to measure growth, the procedures for establishing a developmental scale (e.g., vertical equating); (g) plans for establishing the fairness of the test for all members of the intended population (e.g., differential item functioning); and (h) the process for determining the administrative procedures for conducting the assessment (e.g., mode of administration, inclusion/exclusion of individual test takers, accommodations, and whether make-ups or alternative administrative conditions will be allowed).

The Institute recognizes that all of the issues identified above (e.g., equating of alternate forms of an instrument; vertical equating) may not be applicable to all measurement projects. Applicants who do not address a particular issue should justify their decision. *All applicants should describe the iterative development process to be used in the design and refinement of the proposed measurement tool.*

Applicants must detail planned analytic methods (e.g., statistical and/or psychometric models). Data analysis plans should include treatment of missing responses and criteria for interpreting results. Applicants should describe the characteristics, size, and analytic adequacy of samples to be used in each study, including justification for exclusion and inclusion criteria.

Applicants proposing to use existing data sets (e.g., state or local student achievement databases) to validate an assessment should explicitly address how exclusion from testing, test accommodations, or missing data, will be handled within the statistical analysis. If multiple data sets will be linked for the proposed analyses, applicants should provide sufficient detail of the linking method for reviewers to judge the feasibility of the plan.

Applicants proposing to collect original data should carefully describe the sample, measures (including reliability and validity for the specified purpose), and procedures proposed for the primary data collection. If observational data are collected, applicants should describe how the data would be collected (e.g., procedures for maintaining inter-observer reliability), coded, and analyzed.

Applicants proposing research on assessments of teachers, education leaders, or education systems must relate the assessments to measures of student outcomes.

d. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in (a) content area, (b) assessment development and administration, (c) psychometrics, (d) implementation of, and analysis of results from, the research design that will be employed, and (e) working with teachers, schools, or other education delivery settings in which the proposed assessment might be used. In the project narrative, applicants should briefly describe the qualifications, roles, responsibilities, and percent of time to be devoted to the project for key personnel.

e. Resources
In competitive proposals, applicants will describe having access to institutional resources that adequately support research activities and access to schools in which to conduct the research. Applicants should also demonstrate access to statistical and measurement resources and technical expertise needed for developing and studying assessment instruments and techniques.

f. Additional considerations
Applicants who previously held or currently hold Measurement grants with the Institute should describe the results and outcomes of those grants to date. They should indicate whether what was developed has been (or is being) validated and if results are available, what the results of those studies have been.

The Institute recognizes that there are situations in which researchers may appropriately apply for a second measurement award to further develop or to continue to validate an assessment that was the focus of a previous measurement project (funded by the Institute or other organization). In such cases, the applicant should also provide a compelling rationale of the need for a second measurement award.

Finally, the Institute reiterates that the purpose of Measurement goal grants is to develop and validate new instruments, to modify and validate existing assessments, or to validate existing assessments. Applicants who are interested in testing whether or not using an assessment improves student outcomes must apply under the Efficacy/Replication goal or Scale-up Evaluation goal. In all cases, the Institute encourages interested researchers to contact the relevant program officer for guidance on the appropriate goal for a particular application.

g. Awards
Typical awards under the Measurement goal will be $150,000 to $400,000 (total cost = direct + indirect costs) per year for up to 4 years. Larger budgets will be considered if a compelling case can be made for such support. The size of the award depends on the scope of the project.

PART IV GENERAL SUBMISSION AND REVIEW INFORMATION

20. MECHANISM OF SUPPORT

The Institute intends to award grants pursuant to this request for applications. The maximum length of the award period varies by goal. The maximum length of the award period for each goal ranges from two to five years. Please see details for each goal in *Part III Requirements of the Proposed Research* of the announcement.

21. FUNDING AVAILABLE

The size of the award depends on the scope of the project. Please see specific details in *Part III Requirements of the Proposed Research* of the announcement. Although the plans of the Institute include the research programs (topics) described in this announcement, awards pursuant to this request for applications are contingent upon the availability of funds and the receipt of a sufficient number of meritorious applications. The number of projects funded under a specific topic and goal depends upon the number of high quality applications submitted to that topic and goal. The Institute does not have plans to award a specific number of grants under each particular topic and goal.

22. ELIGIBLE APPLICANTS

Applicants that have the ability and capacity to conduct scientifically valid research are eligible to apply. Eligible applicants include, but are not limited to, non-profit and for-profit organizations and public and private agencies and institutions, such as colleges and universities.

23. SPECIAL REQUIREMENTS

Research supported through this program must be relevant to education in the United States.

Recipients of awards are expected to publish or otherwise make publicly available the results of the work supported through this program. Institute-funded investigators should submit final, peer-reviewed manuscripts resulting from research supported in whole or in part by the Institute to the Educational Resources Information Center (ERIC, http://eric.ed.gov) upon acceptance for publication. An author's final manuscript is defined as the final version accepted for journal publication, and includes all graphics and supplemental materials that are associated with the article. The Institute will make the manuscript available to the public through ERIC no later than 12 months after the official date of publication. Institutions and investigators are responsible for ensuring that any publishing or copyright agreements concerning submitted articles fully comply with this requirement.

Applicants must budget for one meeting each year in Washington, D.C., with other grantees and Institute staff for a duration of up to three days of meetings. At least one project representative must attend the three-day meeting.

The Institute anticipates that the majority of the research funded under this announcement will be conducted in field settings. Hence, the applicant is reminded to apply its negotiated off-campus indirect cost rate, as directed by the terms of the applicant's negotiated agreement.

Research applicants may collaborate with, or be, for-profit entities that develop, distribute, or otherwise market products or services that can be used as interventions or components of interventions in the proposed research activities. Involvement of the developer or distributor must not jeopardize the objectivity of the research.

Applicants may propose studies that piggyback onto an existing study (i.e., requires access to subjects and data from another study). In such cases, the Principal Investigator of the existing study must be one of the members of the research team applying for the grant to conduct the new project.

If an application is being considered for funding based on the technical merit scores from the scientific peer review panel and the research relies on access to secondary data sets, the applicant will need to provide documentation that they have access to the necessary data sets in order to receive a grant. This means that if an applicant does not have permission to use the proposed data sets at the time of application, the applicant will need to provide documentation to the Institute from the entity controlling the data set(s) indicating that the applicant has permission to use the data for the proposed research for the time period discussed in the proposal before the grant will be awarded.

The Institute strongly advises applicants to establish a written agreement among all key collaborators and their institutions (e.g., Principal and Co-Principal Investigators) regarding roles, responsibilities, access to data, publication rights, and decision-making procedures within three months of receipt of an award.

24. DESIGNATION OF PRINCIPAL INVESTIGATOR

The applicant institution is responsible for identifying the Principal Investigator. The Principal Investigator is the individual who has the authority and responsibility for the proper conduct of the research, including the appropriate use of federal funds and the submission of required scientific progress reports. An applicant institution may elect to designate more than one Principal Investigator. In so doing, the applicant institution identifies them as individuals who share the authority and responsibility for leading and directing the research project intellectually and logistically. All Principal Investigators will be listed on any grant award notification. However, institutions applying for funding must designate a single point of contact for the project. The role of this person is primarily for communication purposes on the scientific and related budgetary aspects of the project and should be listed as the Principal Investigator. All other Principal Investigators should be listed as Co-Principal Investigators.

25. LETTER OF INTENT

The Institute asks all applicants to submit a letter of intent by 4:30 p.m. Washington D.C. time on the relevant due date for the competition to which they plan to submit. The information in the letters of intent enable Institute staff to identify the expertise needed for the scientific peer review panels and secure sufficient reviewers to handle the anticipated number of applications. The Institute encourages all interested applicants to submit a letter of intent, even if they think that they might later decide not to submit an application. The letter of intent is not binding and does not enter into the review of a subsequent application. The letter of intent must be submitted electronically using the instructions provided at: https://iesreview.ed.gov. Receipt of the letter of intent will be acknowledged via email.

A. Content

The letter of intent should include:

a. Descriptive title
b. Topic and goal that the applicant will address
c. Brief description of the proposed project
d. Name, institutional affiliation, address, telephone number and e-mail address of the Principal Investigator(s)
e. Name and institutional affiliation of any key collaborators and contractors
f. Duration of the proposed project
g. Estimated total budget request (the estimate need only be a rough approximation)

B. Format and Page Limitation

Fields are provided in the letter of intent for each of the content areas described above. The project description should be single-spaced and should not exceed one page (about 3,500 characters).

26. MANDATORY SUBMISSION OF ELECTRONIC APPLICATIONS

Grant applications must be submitted electronically through the Internet using the software provided on the Grants.gov Web site: http://www.grants.gov/. Applicants must follow the application procedures

and submission requirements described in the Institute's Grants.gov Application Submission Guide and the instructions in the User Guide provided by Grants.gov.

Applications submitted in paper format will be rejected unless the applicant (a) qualifies for one of the allowable exceptions to the electronic submission requirement described in the Federal Register notice announcing the Education Research Grant (CFDA Number 84.305A) competitions described in this Request for Applications and (b) submits, no later than two weeks before the application deadline date, a written statement to the Institute that documents that the applicant qualifies for one of these exceptions. For more information on using Grants.gov, applicants should visit the Grants.gov web site.

27. APPLICATION INSTRUCTIONS AND APPLICATION PACKAGE

A. Documents Needed to Prepare Applications

To complete and submit an application, applicants need to review and use three documents: the Request for Applications, the IES Grants.gov Application Submission Guide, and the Application Package.

- The *Request for Applications* for the Education Research Grant Program (CFDA 84.305A) describes the substantive requirements for a research application.

✓ Request for Applications http://ies.ed.gov/funding/

- The *IES Grants.gov Application Submission Guide* provides the instructions for completing and submitting the forms.

✓ IES Grants.gov Application Submission Guide http://ies.ed.gov/funding/

Additional help navigating Grants.gov is available in the Grants.gov User Guide:

✓ Grants.gov User Guide http://www.grants.gov/help/user_guides.jsp

- The *Application Package* provides all of the forms that need to be completed and submitted. The application form approved for use in the competitions specified in this RFA is the government-wide SF-424 Research and Related (R&R) Form (OMB Number 4040-0001). The applicant must follow the directions in *Section C* below to download the Application Package from Grants.gov.

B. Date Application Package is Available on Grants.gov

The Application Package will be available on http://www.grants.gov/ by the following date:

June Application Package Available by	April 29, 2010
September Application Package Available by	July 19, 2010

C. Download Correct Application Package

a. CFDA number

Applicants must first search by the CFDA number for each IES Request for Applications *without* the alpha suffix to obtain the correct downloadable Application Package. For the Education Research Request for Applications, applicants must search on: **CFDA 84.305**.

b. Education Research Application Package

The Grants.gov search on CFDA 84.305 will yield more than one Application Package. For the Education Research Request for Applications (i.e., the research topics listed in this Request for Applications), applicants must download the package for the appropriate deadline marked:

June Application Package:	**CFDA 84.305A-June Education Research Application Package**
September Application Package:	**CFDA 84.305A-September Education Research Application Package**

In order for the application to be submitted to the correct grant competition, applicants must download the Application Package that is designated for the grant competition and competition deadline. Using a different Application Package, even if that package is for an Institute competition, will result in the application being submitted to the wrong competition; applications submitted to the wrong competition may not be reviewed for the Education Research competition.

28. SUBMISSION PROCESS AND DEADLINE

Applications must be **submitted electronically and received by 4:30:00 p.m**., **Washington, DC time** on the application deadline date, using the standard forms in the Application Package and the instructions provided on the Grants.gov website.

Potential applicants should check this site for information about the electronic submission procedures that must be followed and the software that will be required.

29. APPLICATION CONTENT AND FORMATTING REQUIREMENTS

A. Overview

In this section, the Institute provides instructions regarding the content of the (a) project summary/abstract, (b) project narrative, (c) Appendix A, (d) Appendix B, and (e) bibliography and references cited. Instructions for all other documents to be included in the application (e.g., forms, budget narrative, human subjects narrative) are provided in the IES Grants.gov Application Submission Guide.

B. General Format Requirements

Margin, format, and font size requirements for the project summary/abstract, project narrative, Appendix A, Appendix B, and bibliography are described in this section. To ensure that the text is easy for reviewers to read and that all applicants have the same amount of available space in which to describe their projects, applicants must adhere to the type size and format specifications for the entire narrative including footnotes.

a. Page and margin specifications

For the purposes of applications submitted under this RFA, a "page" is 8.5 in. x 11 in., on one side only, with 1 inch margins at the top, bottom, and both sides.

b. Spacing

Text must be single spaced in the narrative.

c. Type size (font size)

Type must conform to the following three requirements:

- The height of the letters must not be smaller than a type size of 12 point.
- Type density, including characters and spaces, must be no more than 15 characters per inch (cpi).
- For proportional spacing, the average for any representative section of text must not exceed 15 cpi.
- Type size must yield no more than 6 lines of type within a vertical inch.

Applicants should check the type size using a standard device for measuring type size, rather than relying on the font selected for a particular word processing/printer combination. The type size used must conform to all three requirements. Small type size makes it difficult for reviewers to read the application; consequently, the use of small type will be grounds for the Institute to return the application without peer review.

Adherence to type size and line spacing requirements is necessary so that no applicant will have an unfair advantage, by using small type or by providing more text in their applications. **Note, these requirements apply to the PDF file as submitted**. As a practical matter, applicants who use a 12-point Times New Roman font without compressing, kerning, condensing or other alterations typically meet these requirements.

Figures, charts, tables, and figure legends may be in a smaller type size but must be readily legible.

d. Graphs, diagrams, tables
Applicants must use only black and white in graphs, diagrams, tables, and charts. The application must contain only material that reproduces well when photocopied in black and white.

C. Project Summary/Abstract
a. Submission
The project summary/abstract will be submitted as a separate .PDF attachment.

b. Page limitations and format requirements
The project summary/abstract is limited to one single-spaced page and must adhere to the margin, format, and font size requirements above.

c. Content
The project summary/abstract should include:

(1) Title of the project
(2) The RFA topic and goal under which the applicant is applying (e.g., Education Leadership, Development and Innovation goal)
(3) Brief description of the purpose (e.g., to develop and document the feasibility of an intervention)
(4) Brief description of the setting in which the research will be conducted (e.g., rural school districts in Alabama)
(5) Brief description of the population(s) from which the participants of the study(ies) will be sampled (age or grade level, race/ethnicity, SES)
(6) If applicable, brief description of the intervention or assessment to be developed or evaluated or validated
(7) If applicable, brief description of the control or comparison condition (e.g., what will participants in the control condition experience)
(8) Brief description of the primary research method
(9) Brief description of measures and key outcomes
(10) Brief description of the data analytic strategy

Please see the website http://ies.ed.gov/ncer/projects for examples of project summaries/abstracts.

D. Project Narrative
a. Submission
The project narrative will be submitted as a .PDF attachment.

b. Page limitations and format requirements

The project narrative is limited to **25 single-spaced pages** for all applicants. The 25-page limit for the project narrative does not include any of the SF-424 forms, the one-page summary/abstract, the appendices, research on human subjects information, bibliography and references cited, biographical sketches of senior/key personnel, narrative budget justification, subaward budget information or certifications and assurances. If the narrative is determined to exceed the 25 single-spaced page limit, the Institute will remove any pages after the twenty-fifth page of the narrative.

Reviewers are able to conduct the highest quality review when applications are concise and easy to read, with pages numbered consecutively using the top or bottom right-hand corner.

c. Format for citing references in text

To ensure that all applicants have the same amount of available space in which to describe their projects in the project narrative, applicants should use the author-date style of citation (e.g., James, 2004), such as that described in the *Publication Manual of the American Psychological Association, 6th Ed.* (American Psychological Association, 2009).

d. Content

To be compliant with the requirements of the Request for Applications, the project narrative must include four sections: (a) Significance, (b) Research Plan, (c) Personnel, and (d) Resources. Information to be included in each of these sections is detailed in *Part III Requirements of the Proposed Research* and in specific requirements subsections for each research topic in *Part II Research Grant Topics*. Incorporating the requirements outlined in these sections provides the majority of the information on which reviewers will evaluate the proposal.

E. Appendix A

a. Submission

Appendix A should be included at the end of the Project Narrative and submitted as part of the same .PDF attachment.

b. Page limitations and format requirements

Appendix A is limited to 15 pages. It must adhere to the margin, format, and font size requirements described in *Section 28.B General Format Requirements*.

c. Content

(i) Purpose

The purpose of Appendix A is to allow the applicant to include any figures, charts, or tables that supplement the research text, examples of measures to be used in the project, and letters of agreement from partners (e.g., schools) and consultants. In addition, in the case of a resubmission, the applicant may use up to 3 pages of the appendix to describe the ways in which the revised proposal is responsive to prior reviewer feedback. Similarly, applicants who have submitted a somewhat similar proposal in the past but are submitting the current proposal as a new proposal may use up to 3 pages in Appendix A to provide a rationale explaining why the current proposal should be considered to be a "new" proposal rather than a "revised" proposal. These are the only materials that may be included in Appendix A; all other materials will be removed prior to review of the application. Narrative text related to any aspect of the project (e.g., descriptions of the proposed sample, the design of the study, the analysis plan, or previous research conducted by the applicant) must be included in the research narrative.

(ii) Letters of agreement

Letters of agreement should include enough information to make it clear that the author of the letter understands the nature of the commitment of time, space, and resources to the research project that will be required if the application is funded. The Institute recognizes that some

applicants may have more letters of agreement than will be accommodated by the 15-page limit. In such instances, applicants should include the most important letters of agreement and may list the letters of agreement that are not included in the application due to page limitations.

F. Appendix B (Optional)

a. Submission

If applicable, Appendix B should be included at the end of the Project Narrative, following Appendix A, and submitted as part of the same .PDF attachment.

b. Page limitations and format requirements

Appendix B is limited to 10 pages. It must adhere to the margin, format, and font size requirements described in *Section 23.B General Format Requirements*.

c. Content

Appendix B applies to applications under all topics in this RFA. The purpose of Appendix B is to allow applicants who are proposing to develop, evaluate, or validate an intervention or assessment to include examples of curriculum material, computer screens, assessment items, or other materials used in an intervention or assessment that is pertinent to the proposed project. These are the only materials that may be included in Appendix B; all other materials will be removed prior to review of the application. Narrative text regarding these materials (e.g., descriptions of research that supports the use of the intervention/assessment, the theoretical rationale for the intervention/assessment, or details regarding the implementation or use of the intervention/assessment, or rationale for choosing a particular instrument) must be included in the 25-page research narrative.

G. Bibliography and References Cited

a. Submission

The section will be submitted as a separate .PDF attachment.

b. Page limitations and format requirements

There are no limitations to the number of pages in the bibliography. The bibliography must adhere to the margin, format, and font size requirements described in *Section 28.B General Format Requirements*.

c. Content

Applicants should include complete citations, including the names of all authors (in the same sequence in which they appear in the publication), titles (e.g., article and journal, chapter and book, book), page numbers, and year of publication for literature cited in the research narrative.

30. APPLICATION PROCESSING

Applications must be **submitted electronically and received by 4:30:00 p.m., Washington, D.C. time** on the application deadline date listed in the heading of this request for applications. Upon receipt, each application will be reviewed for completeness and for responsiveness to this request for applications. Applications that do not address specific requirements of this request will be returned to the applicants without further consideration.

31. PEER REVIEW PROCESS

Applications that are compliant and responsive to this request will be evaluated for scientific and technical merit. Reviews will be conducted in accordance with the review criteria stated below by a panel of scientists who have substantive and methodological expertise appropriate to the program of research and request for applications.

Each application will be assigned to one of the Institute's scientific review panels. At least two primary reviewers will complete written evaluations of the application, identifying strengths and weaknesses related to each of the review criteria. Primary reviewers will independently assign a score for each

criterion, as well as an overall score, for each application they review. Based on the overall scores assigned by primary reviewers, an average overall score for each application will be calculated and a preliminary rank order of applications will be prepared before the full peer review panel convenes to complete the review of applications.

The full panel will consider and score only those applications deemed to be the most competitive and to have the highest merit, as reflected by the preliminary rank order. A panel member may nominate for consideration by the full panel any proposal that he or she believes merits full panel review but would not have been included in the full panel meeting based on its preliminary rank order.

32. REVIEW CRITERIA FOR SCIENTIFIC MERIT

The purpose of Institute-supported research is to contribute to the solution of education problems and to provide reliable information about the education practices that support learning and improve academic achievement and access to education for all students. Reviewers for all applications will be expected to assess the following aspects of an application in order to judge the likelihood that the proposed research will have a substantial impact on the pursuit of that goal. Information pertinent to each of these criteria is also described above in *Part III Requirements of the Proposed Research* and in the section of the relevant research grant topic.

A. Significance

Does the applicant provide a compelling rationale for the significance of the project as defined in the Significance of Project section for the goal under which the applicant is submitting the proposal?

B. Research Plan

Does the applicant meet the requirements described in the methodological requirements section for the goal under which the applicant is submitting the proposal?

C. Personnel

Does the description of the personnel make it apparent that the Principal Investigator, project director, and other key personnel possess appropriate training and experience and will commit sufficient time to competently implement the proposed research?

D. Resources

Does the applicant have the facilities, equipment, supplies, and other resources required to support the proposed activities? Do the commitments of each partner show support for the implementation and success of the project?

33. RECEIPT AND START DATE SCHEDULE

A. Letter of Intent Receipt Dates

June Application Letter of Intent	April 29, 2010
September Application Letter of Intent	July 19, 2010

B. Application Deadline Dates

June Application Deadline Date	June 24, 2010
September Application Deadline Date	September 16, 2010

C. Earliest Anticipated Start Date

For June Application	March 1, 2011
For September Application	July 1, 2011

D. Latest Possible Start Date

For June Application	September 1, 2011
For September Application	September 1, 2011

The grant review and award process takes approximately eight months from the time of submission of the application. Applicants will be notified about funding decisions via email *no later than* the earliest anticipated start date (March 1, 2011 or July 1, 2011).

34. AWARD DECISIONS

The following will be considered in making award decisions:

- Scientific merit as determined by peer review
- Responsiveness to the requirements of this request
- Performance and use of funds under a previous Federal award
- Contribution to the overall program of research described in this request
- Availability of funds

35. INQUIRIES MAY BE SENT TO

A. Reading and Writing

Dr. Emily Doolittle
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Washington, DC 20208

Email: Emily.Doolittle@ed.gov
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B. Mathematics and Science Education

Dr. Christina Chhin
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C. Cognition and Student Learning

Dr. Carol O'Donnell
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D. Teacher Quality (Reading and Writing and Mathematics and Science Education)

Dr. Harold Himmelfarb
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E. Social and Behavioral Context for Academic Learning

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F. Education Leadership

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G. Organization and Management of Schools and Districts

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H. Education Policy, Finance, and Systems

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I. Early Learning Programs and Policies

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J. English Learners

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K. Postsecondary Education

Dr. David Sweet
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Washington, DC 20208

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L. Adult Education

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M. Education Technology

Dr. Jonathan Levy
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Washington, DC 20208

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N. Analysis of Longitudinal Data to Support State and Local Education Reform

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36. PROGRAM AUTHORITY

20 U.S.C. 9501 et seq., the "Education Sciences Reform Act of 2002," Title I of Public Law 107-279, November 5, 2002. This program is not subject to the intergovernmental review requirements of Executive Order 12372.

37. APPLICABLE REGULATIONS

The Education Department General Administrative Regulations (EDGAR) in 34 CFR parts 74, 77, 80, 81, 82, 84, 85, 86 (part 86 applies only to institutions of higher education), 97, 98, and 99. In addition 34 CFR part 75 is applicable, except for the provisions in 34 CFR 75.100, 75.101(b), 75.102, 75.103, 75.105, 75.109(a), 75.200, 75.201, 75.209, 75.210, 75.211, 75.217, 75.219, 75.220, 75.221, 75.222, and 75.230.

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