INSTITUTE OF EDUCATION SCIENCES

REQUEST FOR APPLICATIONS

Education Research Grants

CFDA Number: 84.305A

COMPETITION ROUND	JUNE	OCTOBER
Letter of Intent Due Date (https://ies.constellagroup.com/)	04/27/2009	08/03/2009
Application Package Available (http://www.grants.gov/)	04/27/2009	08/03/2009
Application Due Date (http://www.grants.gov/)	06/25/2009	10/01/2009

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; Early Childhood Programs and Policies; Middle and High School Reform; Interventions for Struggling Adolescent and Adult Readers and Writers; English Language Learners; Postsecondary Education; and Education Technology. For the FY 2010 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 and to the discretionary grant competitions funded through the Institute's National Center for Special Education Research (http://ies.ed.gov/funding).

2. OVERVIEW

Through its Education Research grant program, the Institute supports research over a diverse set of topics and for a range of purposes. The topics 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 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

Goal One: 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 or education programs, practices, and policies), as well as mediators and 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.

Exploratory research results in hypothesis generation and theory development. What are the relations between malleable factors within the education context and education outcomes? In what ways might variation within a particular factor (e.g., instructional practice) be associated with different education outcomes?

Since the Institute established the goal structure, approximately 9 percent of the projects funded through the Education Research grant program are exploratory projects (National Board for Education Sciences, 2008).[1]

[1]This percentage is based on all grants funded through the regular 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)

Goal Two: Development and Innovation

The Institute supports projects to develop innovative education interventions – 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 an 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* interventions.

Since the Institute established the goal structure for its Education Research grant program, about 53 percent of the funded projects have been development projects.[1]

Goal Three: 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. In efficacy studies, interventions are often implemented with more support from the developer/researcher than would typically be available to schools. Efficacy projects determine whether an intervention *can* have a positive impact on the outcomes of interest.

Efficacy projects also provide estimates 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 23 percent of the funded projects have been efficacy and replication projects.[1]

Goal Four: Scale-up Evaluations

If interventions are able to produce positive effects in small 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 3 percent of the funded projects have been scale up projects.[1]

Goal Five: Measurement

Finally, the Institute supports research to develop and validate measurement instruments that are intended for use by practitioners for purposes such as screening, progress monitoring, and outcome assessments.

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 sift the wheat from the chaff and identify those programs that do in fact improve student outcomes. Hence, before we support widespread adoption of an intervention that has demonstrated positive effects in small efficacy and replication trials, we must make sure they work as expected when they are scaled up.

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 Goal One, 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 Goal Two, 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. Under Goals Three and Four, the efficacy and scale-up evaluations assess the impact of specific interventions and constitute tests of the theory (of change). Results from these studies should inform further theory development and refinement. Through Goal Five, the 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 2010, the Institute's National Center for Education Research is accepting applications for research grants on June 25, 2009 and October 1, 2009. In this section, the Institute describes the 14 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. 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) 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.

B. Background

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. The 2007 NAEP writing assessment indicated that 12 percent of eighth-graders and 18 percent of twelfth-graders could not write at the basic level.

Although tremendous advances have been made in understanding how children learn to read and write, we have less systematic knowledge about how individuals become proficient readers or proficient writers. There is subsequently little agreement as to what a teacher can or should do to cultivate active, engaged, and proficient readers and writers. On the 2007 NAEP, only 33 percent of fourth-graders and 31 percent

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

of eighth-graders were reading at the proficient or advanced levels. On the 2005 NAEP, 35 percent of twelfth-graders were reading at the proficient or advanced levels. With regard to writing, on the 2002 NAEP, 28 percent of fourth-graders were at the proficient or advanced levels. On the 2007 NAEP 33 percent of eighth-graders and 24 percent of twelfth-graders were at the proficient or advanced levels.

The Institute invites applicants to consider how to improve the reading comprehension of learners of all skill levels. Improving reading comprehension requires the development and evaluation of curricula and instructional approaches that support the growth of proficient readers, the exploration of instructional factors that appear to contribute to improved reading comprehension outcomes, as well as the development and validation of new and innovative measurement tools that can be used to determine whether students are making adequate progress on the skills that contribute to reading comprehension.

Under the Reading and Writing program, the Institute supports research to develop innovative curricula or instructional approaches designed to support the development of proficient readers and writers from kindergarten through high school, and basic writing skills at the postsecondary level and to evaluate the impact of curricula and instructional approaches on improving student outcomes.

The Institute encourages researchers to explore malleable factors (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 factors and student outcomes, for the purpose of identifying potential points of intervention. This is translational research intended to inform the development of innovative programs, practices, or products to improve reading and writing achievement. One approach to the exploration of malleable factors is for researchers to conduct detailed, quantifiable observations of reading or writing instruction (types of instruction, frequency, duration, under what circumstances), and then use the instructional data in conjunction with child characteristics to predict subsequent reading or writing performance. The goal here is to identify what type or combination of instructional activities is associated with better student outcomes and for which students. Researchers who can successfully predict student performance could use this information as the basis for developing an 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 reading or writing outcomes and to examine factors and conditions that may mediate or moderate the relations between the student outcomes and these programs and practices.

The Institute seeks proposals to develop and/or validate reading or writing measurement tools for classroom assessments to be used for instructional purposes (e.g., progress monitoring). To improve reading and writing 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. The Institute intends to support the development and/or validation of diagnostic assessments and progress monitoring assessments of reading and writing.

In addition, the Institute particularly encourages research on assessments of reading comprehension. Current measures of reading comprehension provide limited, and often divergent, information about the skills of the readers being assessed. These measures typically only indicate whether a reader is a "good" or "poor" comprehender, and do not provide information about why a reader is struggling to comprehend. Is the failure to comprehend attributable to (a) an inability to identify which components of a text represent the main idea; (b) difficulty drawing inferences within a sentence, paragraph, or entire text; or (c) some other skill or constellation of skills? The Institute invites researchers to consider these types of questions as they develop, revise, and validate assessments of reading comprehension.

C. Specific Requirements

a. Submission to a specific goal

For the Reading and Writing topic, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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, applications must address

- malleable factors that are associated with reading or writing outcomes from kindergarten through high school for the purpose of identifying potential targets for intervention; or
- mediators or moderators of the relations between malleable factors and reading or writing outcomes from kindergarten through high school for the purpose of identifying potential targets for intervention; or
- reading or writing curricula designed to support the development of proficient readers or writers from kindergarten through high school; or
- instructional approaches for teaching reading or writing that could be implemented within the context of an existing reading or writing program from kindergarten through high school; or
- at the postsecondary level, English composition courses intended to teach basic writing skills (e.g., instruction in grammar, organization, audience, style, and writing clear prose). Proposals to conduct research on curricula or instructional approaches for teaching creative writing or literature will not be considered; or
- reading or writing assessments to support instruction from kindergarten through high school or to support basic writing instruction at the postsecondary level.

Under the Read/Write 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 by the No Child Left Behind Act of 2001.

Researchers who are interested in proposing to develop or evaluate curricula or instructional approaches targeting struggling adolescent or adult readers or writers should apply to the Interventions for Struggling Adolescent and Adult Readers and Writers program.

Researchers who are interested in conducting research that addresses the needs of English language learners should apply to the English Language Learners program.

4. 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[3] (e.g., children's skills, instructional practices, curricula)

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

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 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. 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.

Very little rigorous research has been conducted to evaluate the effectiveness of mathematics or science curricula and instructional practices for improving student learning and achievement. The Institute's What Works Clearinghouse conducted reviews of elementary and middle school mathematics curricula. For elementary school mathematics curricula, 237 studies were identified that: (a) were curriculum evaluations; (b) included relevant math outcome measures; and (c) covered at least one semester. Out of these studies, two studies met the Clearinghouse's evidence standards for drawing causal conclusions, seven studies met the evidence standards with reservations, and 227 studies did not meet the evidence screens.[4] For the middle school mathematics curricula, 158 studies were identified as curriculum evaluations with relevant math outcomes that covered at least one semester. Out of these 158 studies, four studies met the Clearinghouse's evidence standards, 17 met the evidence standards with reservations, and 137 did not meet the evidence screens.[5] Out of the 395 evaluations of elementary and

[4] Note that one study has a disposition pending. Accessed from the What Works Clearinghouse on January 26, 2009, at http://ies.ed.gov/ncee/wwc/reports/.

[5] Accessed from the What Works Clearinghouse on January 26, 2009, at http://ies.ed.gov/ncee/wwc/reports/.

middle school mathematics curricula, the What Works Clearinghouse has found that 92 percent of the studies either employed research methods that were inappropriate for supporting causal conclusions, or insufficient information was reported for the Clearinghouse to calculate effect sizes. To address the need to improve mathematics and science education in the United States, the Institute seeks to fund applications that address the need to develop and evaluate mathematics or science curricula and instructional approaches.

The Institute intends for the Mathematics and Science Education program to support research to develop innovative curricula and instructional approaches intended to improve mathematics and science proficiency from kindergarten through high school, and basic mathematics skills at the postsecondary and adult education levels. 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 supports the evaluation of the impact of curricula and instructional approaches on student outcomes.

The Institute 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. One approach to the exploration of malleable factors is for researchers to conduct detailed, quantifiable observations of mathematics or science instruction (types of instruction, frequency, duration, under what circumstances), and then use the instructional data in conjunction with child characteristics to predict subsequent math or science performance. The goal here is to identify what type or combination of instructional activities is associated with better student outcomes and for which students. Researchers who can successfully identify strong correlates of student performance could use this information as the basis for developing an 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 mathematics or science outcomes and to examine factors and conditions that may mediate or moderate the relations between the student outcomes and these programs and practices.

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 *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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, applications must address

- malleable factors that are associated with mathematics or science achievement for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors and mathematics or science achievement for the purpose of identifying potential targets of intervention; or
- mathematics or science curricula designed to improve mathematics or science proficiency; or
- instructional approaches for teaching mathematics or science that could be implemented within the context of existing mathematics or science curricula; or
- assessments to support mathematics or science instruction.

Under the Math/Science program:

- Applications relevant to mathematics education must be for students from kindergarten through high school or for students in adult and vocational education programs or in developmental/bridge programs designed to help under-prepared students acquire the skills to succeed in college.

- Applications relevant to science education must be for students from kindergarten through high school.

- 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 by the No Child Left Behind Act of 2001.

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

Researchers who are interested in conducting research that addresses the needs of English language learners should apply to the English Language Learners program.

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)/bride programs for under-prepared college students.

B. Background

The most important outcome of education is student learning. Recent advances in understanding learning have come from cognitive science, as well as cognitive and developmental psychology, but these

advances have not been widely or systematically tapped in education. The Institute intends for the Cognition research program to establish a scientific foundation for education by building on these theoretical and empirical advances and applying them to education practice with the goal of improving student learning and academic achievement. The Institute is supporting research on this topic to bridge basic cognitive science and education.

Cognitive science has shown explosive growth in the last 30 years. Basic laboratory research in cognitive science within disciplines such as psychology, linguistics, and neuroscience has generated new and important fundamental knowledge on how people learn. Cognitive scientists have identified a number of basic principles of learning that are supported by a solid research base (for examples, see Carver and Klahr 2001). For the most part, however, these research principles have not been incorporated into education practice, either at the level of instruction or through the creation of materials that support teaching and learning.

Authentic education settings are often quite different from the laboratory. Contrasted with learning in laboratory settings, learning in everyday instructional settings typically involves content of greater complexity and scope, delivered over much longer periods of time, with much greater variability in delivery, and with far more distractions and competitors for student time and effort. Moreover, the parameters that have defined "learning" in laboratory experiments are often not the same as what defines learning in school. For example, in laboratory experiments, learning is typically defined as having occurred if individuals can recall an item a few minutes or hours after presentation; rarely are individuals asked to recall items days, weeks, or months after presentation. In school, however, students are expected to remember information presented in September the following May, and to be able to use that information in subsequent years. Students in school are expected to learn sets of related concepts and facts, and to build on that knowledge over time. Before some principles of learning generated from research in cognitive science can be applied to instruction in classroom settings, we need to understand if the principles generalize beyond well-controlled laboratory settings to the complex cognitive and social conditions of the classroom.

Through the Cognition research program, the Institute supports research that utilizes cognitive science to develop 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 Goal One (Exploration), the Institute 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 Goal One projects might explore 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 Goal One proposals, strong applications would include a rationale that justifies the plausibility of developing interventions that might improve the targeted underlying skills.

In addition, the Institute 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 *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Five. The Institute numbers goals consistently across research grant programs. The Institute does *not* accept applications under Goal Four 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 33 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, applications must address

- malleable factors that are associated with student outcomes in reading, pre-reading, writing, pre-writing, mathematics, early mathematics, science, early science, or study skills for students from prekindergarten through high school for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors and student outcomes in reading, pre-reading, writing, pre-writing, mathematics, early mathematics, science, early science, or study skills for students from prekindergarten through high school for the purpose of identifying potential targets of intervention; or
- curricula, instructional practices, or assessments in reading, pre-reading, writing, pre-writing, mathematics, early mathematics, science, early science, or study skills for students from prekindergarten through high school; or

- malleable factors that are associated with student outcomes in 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; or
- curricula, instructional practices, or assessments in 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 Goals One and Five, the research may be conducted in laboratory and/or authentic education settings.

Under Goal Two, 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 5.C.b. Content and Sample Requirements.

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

6. 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[6] (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 (a) teaching reading or writing from kindergarten through high school and (b) teaching basic skills in reading or writing to adults. By "professional development" the Institute refers to in-service training of or tools for current instructional personnel.

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

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.

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 development and evaluation of 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*.

Under Teacher Quality – Read/Write, the Institute encourages research to determine *what content* should be delivered to teachers to improve instruction and thereby student outcomes. That is, what are the knowledge and skills that, if applied by teachers, would improve student outcomes? The Institute also invites proposals to determine *how to deliver* the content of the professional development, in order to change teacher behaviors and have an impact on relevant student outcomes. The Institute suggests that researchers consider testing different delivery modes using a curriculum or instructional approach that has already been shown to be effective for improving student outcomes. The Institute encourages researchers to consider how the *complexity* and *amount of content* to be delivered may affect the type and amount of professional development that is necessary for enabling teachers to reach a set performance criterion level. For example, is one-on-one coaching a critical component of professional development training for all types of knowledge and skills or only for the development of complex skills?

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 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, and Simon 2000; Carver and Klahr 2001).

In addition to research on the development and evaluation of 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 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 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 – Read/Write topic, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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 address

- malleable teacher level factors (teacher behaviors, professional development practices) that are associated with student outcomes in reading or writing for the purpose of identifying potential targets of intervention; or

- mediators or moderators of the relations between malleable factors relevant to teacher professional development and student outcomes in reading or writing for the purpose of identifying potential targets of intervention; or
- interventions for teachers or other instructional personnel that are designed to change practices in ways that improve student outcomes in reading or writing; or
- assessments of subject matter knowledge, pedagogical knowledge, or instructional practices in reading and writing for teachers or other instructional personnel.

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 high school or to the instruction of reading or basic writing skills to adults through vocational education, adult education or developmental (remedial) programs designed to help under-prepared students acquire the skills to succeed in college.
- 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. 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 student outcomes as well as measures of teacher behaviors.
- 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 teacher professional development for prekindergarten teachers should apply to the Early Childhood Programs and Policies research program.

Applicants interested in professional development for teachers of English language learners should apply to the English Language Learner research 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 Reading and Writing topic. Applications that are appropriate for the Reading and Writing topic are those that develop and/or evaluate specific reading or writing curricula or instructional approaches for students, whereas applications that are appropriate for the Teacher Quality program are those that have teachers as the primary target of the intervention. The Institute recognizes that this distinction may be blurred. Oftentimes implementation of a specific reading or writing curriculum includes training for teachers 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 teachers. If the investigator is focusing on the outcomes of variations in curriculum content or variations in instructional approaches, then the application should be submitted to the Research on Reading and Writing topic or the Interventions for Struggling Adolescent and Adult Readers and Writers topic. If the

researcher is examining outcomes of variations in approaches to teacher professional development training, then the application should be submitted to the Teacher Quality – Read/Write topic. Below are some examples to help clarify the intent of the two programs. In all cases, the Institute strongly encourages applicants to contact the relevant program officer listed in section 33 and the program officer for the Reading and Writing research program to help them identify the more appropriate topic under which to submit their application.

Projects for Teacher Quality – Read/Write Topic	**Projects for the Reading and Writing Topic**
Example A The district uses Reading Curriculum A for its elementary school students. Applicant proposes to test professional development training on reading instruction; half of the teachers receive the new training and half receive the district's regular training. All students receive Reading Curriculum A.	**Example B** The applicant proposes to evaluate a reading curriculum for grade 4 students. Half of the students will receive the new curriculum; half of the students will use the district's existing reading curriculum. The teachers whose students receive the new curriculum will receive training on how to implement the new curriculum. All teachers will participate in the district's professional development on reading.
Example C The applicant wants to test whether professional development to improve writing instruction can be delivered effectively using an online coaching model for teachers that is available to teachers on a daily basis versus a writing instruction coach who visits the classroom. Half of the teachers receive online coaching; half receive in-class coaching. The content of the professional development is the same for teachers in both groups. The basic curriculum that the students receive is the same in both groups.	**Example D** The applicant proposes to compare two different instructional approaches for teaching reading comprehension strategies to middle school students in the context of a social studies curriculum. All students receive the same social studies curriculum. Half of the students receive instruction using Instructional Approach A; the remaining students receive instruction using Instructional Approach B.

7. 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[7] (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

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

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 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 development and evaluation of 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.

Under Teacher Quality – Math/Science, the Institute encourages research to determine *what content* should be delivered to teachers to improve instruction and thereby student outcomes. That is, what are the knowledge and skills that, if applied by teachers, would improve student outcomes? The Institute also invites proposals to determine *how to deliver* the content of the professional development, in order to

change teacher behaviors and have an impact on relevant student outcomes. The Institute suggests that researchers consider testing different delivery modes using a curriculum or instructional approach that has already been shown to be effective for improving student outcomes. The Institute encourages researchers to consider how the *complexity* and *amount of content* to be delivered may affect the type and amount of professional development that is necessary for enabling teachers to reach a set performance criterion level. For example, is one-on-one coaching a critical component of professional development training for all types of knowledge and skills or only for the development of complex skills?

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 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 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, and Simon 2000; Carver and 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 under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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, applicants must address

- malleable factors (teachers' behaviors, professional development practices) that are associated with student outcomes in mathematics or science for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors relevant to teacher professional development and student outcomes in mathematics or science for the purpose of identifying potential targets of intervention; or
- interventions for teachers or other instructional personnel that are designed to change practices in ways that improve student outcomes in mathematics or science; or
- assessments of subject matter knowledge, pedagogical knowledge, or instructional practices in mathematics or science for teachers or other instructional personnel.

Under the Teacher Quality–Math/Science program:

- Applications must be relevant to the mathematics or science instruction of students in any grade(s) from kindergarten through high school or to the instruction of basic mathematics skills to adults through vocational education, adult education or developmental (remedial) programs designed to help under-prepared students acquire the skills to succeed in college.
- 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 student outcomes as well as measures of teacher behaviors.
- 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 teacher training for prekindergarten teachers should apply to the Early Childhood Programs and Policies research program.

Researchers interested in professional development for teachers of English language learners should apply to the English Language Learner research 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 Mathematics and Science Education topic. Applications that are appropriate for the Mathematics and Science Education topic are those that develop and/or evaluate specific mathematics or science curricula or instructional approaches for students, whereas applications that are appropriate for the Teacher Quality program are those that have teachers as the primary target of the intervention. The Institute recognizes that this distinction may be blurred. Oftentimes implementation of a specific mathematics or science curriculum includes training for teachers 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 teachers. If the investigator is focusing on the outcomes of variations in curriculum content or variations in instructional approaches, then the application should be submitted to the Mathematics and Science Education topic. If the researcher is examining outcomes of variations in approaches to teacher training, then the application should be submitted to the Teacher Quality–Math/Science topic. Below are some examples to help clarify the intent of the two programs. In all cases, the Institute strongly encourages applicants to contact the relevant program officer listed in section 33 and the program officer for the Mathematics and Science Education research program to help them identify the more appropriate topic under which to submit their application.

Projects for Teacher Quality – Math/Science Topic	Projects for the Mathematics and Science Education Topic
Example A The district uses Math Curriculum A for its elementary school students. Applicant proposes to test professional development training on math instruction; half of the teachers receive the new training and half receive the district's regular training. All students receive Math Curriculum A.	**Example B** The applicant proposes to evaluate a math curriculum for grade 4 students. Half of the students will receive the new curriculum; half of the students will use the district's existing math curriculum. The teachers whose students receive the new curriculum will receive training on how to implement the new curriculum. All teachers will participate in the district's professional development on math.
Example C The applicant wants to test whether professional development to improve science instruction can be delivered effectively using an online coaching model for teachers that is available to teachers on a daily basis versus a science instruction coach who visits the classroom. Half of the teachers receive online coaching; half receive in-class coaching. The content of the professional development is the same for teachers in both groups. The basic curriculum that the students receive is the same in both groups.	**Example D** The applicant proposes to evaluate an instructional approach for teaching science to middle school students. All students use the same textbooks. Half of the students are taught the content using the new instructional approach; the remaining students are taught as their teachers normally teach their classes. Only the teachers of students in the treatment group are trained to use this new instructional approach for teaching science.

8. 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[8] (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.

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

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, and 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 and 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). For example, the What Works Clearinghouse reviewed the research on school-based interventions designed to improve character education. Ninety-three evaluation studies of character education interventions covering 41 character education interventions were identified, but only one-fifth of the studies (18 studies of 13 programs) met the What Works Clearinghouse standards of evidence with or without reservations.[9] Moreover, the What Works Clearinghouse identified an additional 14 interventions for which no evaluation studies were found. Similarly, when the What Works Clearinghouse reviewed interventions intended to reduce dropout rates, 84 studies of 22 programs were identified, but only one-third met the What Works Clearinghouse standards of evidence with or without reservations.[10] 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, the Institute endeavors to address this problem by supporting research on the development and evaluation of 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

[9] Accessed from the What Works Clearinghouse on January 26, 2009 at http://ies.ed.gov/ncee/wwc/reports/character_education/topic/.

[10] Accessed from the What Works Clearinghouse on January 26, 2009 at http://ies.ed.gov/ncee/wwc/reports/dropout/topic/.

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 *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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 applications must address

- malleable social skills and behaviors that are correlated with academic outcomes or malleable factors (e.g., social skills programs) that are associated with social skills or behaviors that support academic outcomes for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors relevant to social skills or behaviors and student academic outcomes for the purpose of identifying potential targets of intervention; or
- interventions (e.g., curricula, classroom management programs, teacher professional development) that are implemented by schools and are intended to improve social skills and behaviors that support academic outcomes in schools or other education delivery entities; or
- measures of children's behaviors and social skills or teacher classroom management practices that are strongly associated with academic outcomes.

Under the Social/Behavioral program:

- The Institute will support research on interventions for students that are implemented by teachers or other school staff (e.g., school administrators, guidance counselors, school psychologists) 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' academic outcomes. By academic outcomes, the Institute means those measures of learning and achievement that are important to parents and school administrators (e.g., grades, end-of-course exams, achievement test scores, graduation rates, drop-out rates).

9. 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[11] (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, and 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 and 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

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

examining how these needed skills and knowledge might vary according to school context (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 below.

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 Goal Five 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 the development (Goal Two) or evaluation (Goals Three and Four) of 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., Goal Three Efficacy 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 *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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, applications must address

- malleable factors (e.g., practices of education leaders, leadership policies, professional development programs) that are associated with student achievement for the purpose of identifying potential targets of intervention for students from kindergarten through high school; or
- mediators or moderators of the relations between malleable factors relevant to education leadership (e.g., practices of education leaders, leadership policies, professional development programs) and student achievement for the purpose of identifying potential targets of intervention; or
- programs or policies (e.g., professional development, recruitment or retention programs, alternative certification programs) intended to improve the quality of education leaders at the building or district-level from kindergarten through high school and thereby improve student outcomes; or
- assessments of education leaders at the building or district-level from kindergarten through high school.

Under the Education Leadership program:

- 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.
- All applicants under Goal Three and Goal Four must include measures of student academic outcomes (e.g., end-of-course exams, graduation rates, disciplinary actions, scores on state assessments).

10. 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 address five goals: (1) exploring malleable factors[12] (e.g., systemic programs, policies, 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 policies and systemic practices that are intended to improve student outcomes either directly or indirectly by improving the teaching and learning environment; (3) evaluating the efficacy of education policies, education finance programs and practices, and systemic programs and practices that are intended to improve student outcomes either directly or indirectly by improving the teaching and learning environment; (4) evaluating the impact of policies, finance programs and practices, and other systemic practices 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 practical measures of the organization and operation of schools or school systems and validating such measures against student outcomes or developing and testing cost accounting tools that will enable education administrators to link 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 by identifying changes in the ways in which schools and districts are organized, managed, and operated that may be directly or indirectly linked to student outcomes. Rather than improving student learning by changing the curricula or instructional approaches, organizational and management approaches are generally designed to change the structure and operation of schools or districts in ways that may improve the overall teaching and learning environment, and indirectly improve student achievement. For example, differences in achievement among schools and districts serving students of similar economic and racial/ethnic backgrounds are likely to reflect, in part, differences in the alignment of components of policy and practice. When these differences occur within states where every school is operating under the same state standards and accountability system, they point to the potential importance of organizational and management variables at the local level in enhancing student learning. The types of projects that are appropriate for this program are illustrated by, but not limited to, the examples provided below.

As part of the Policy/Finance research program, the Institute encourages research to identify ways in which money and 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 (e.g., bonuses for the most skillful teachers and administrators to serve in high-needs schools)?

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

Little rigorous research has been performed that examines either a direct causal relation or associations between student achievement and various systemic or organizational strategies. For example, the Institute encourages research on the relations between different forms of school governance (e.g., elected versus appointed boards, state or mayoral takeovers) and student achievement, and research on the relations between different forms of school organization and structure (e.g., extended-day versus traditional school day, year-round schooling versus traditional academic year calendar) and student achievement. There is a dearth of rigorous research on how the implementation or effects of specific systemic strategies might vary according to school characteristics (e.g., experience-level or turnover rate of teaching staff, substantial proportions of high-poverty students). Similarly, little work has been conducted to determine the effects on student learning of making different choices in strategies or investments (e.g., smaller classes with less experienced, lower salaried teachers versus larger classes with higher paid, more experienced, and highly skilled teachers). The Institute welcomes proposals to examine the relation between specific strategies (such as alignment of curriculum, assessment, and performance standards) and student outcomes. For example, the Institute encourages research on supplemental education services such as tutoring. What kinds of supplemental education services (one-on-one tutoring, small-group prescriptive skill-building, individualized gap assessment and remediation, small-group drill and practice) are effective for improving student learning? How can these services be aligned with the instructional programs of districts and with state academic, content, and achievement standards to maximize student learning? 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 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).

Over the past decade, numerous problems have been noted with respect to using per-pupil expenditure data that are aggregated at the district- or school-level for answering questions related to how schools can make better use of their resources to improve student learning (National Research Council 1999). For example, school districts commonly use district-wide averages of teacher salaries in estimating costs for

individual schools; district-wide averages tend to hide the disparity across schools within a district. School-level per-pupil expenditure data collapse expenditures across students receiving different services, and when these data are associated with school-level student achievement scores, the data do not enable administrators to make informed decisions about the allocation of resources in ways that are meaningfully linked to student learning.

Under Goal Five (Measurement), the Institute accepts applications to develop and validate cost-accounting tools as well as applications to develop measures of the organization and management of schools or school systems and to validate such measures against student outcomes. For cost-accounting, 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. As noted in the National Research Council (1999) report, "traditional function and object categories that were developed to track revenues and expenditure data for fiscal auditing purposes do not represent a particularly useful lens on educational activity when the focus shifts to what schools strive to do instructionally and how they do it." Researchers are encouraged to develop and test new cost accounting tools or measurement systems that will invent, test, and analyze student or school resource measures to determine productivity. Researchers may build on or modify previous systems, such as those identified by Berne and Stiefel (1997), or develop and test entirely new approaches. 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 (including, for example, students from racial, ethnic, and linguistic minority groups who have traditionally underachieved academically, and students with disabilities), and the excess costs of educating students with special needs in specific categories of expenditure. The Institute encourages researchers to work with large districts or consortia of districts to develop cost accounting tools that would enable administrators to analyze the relations between resource allocation and student achievement.

Under Goal Five, the Institute also strongly encourages applications to develop measures of the organization and operation of schools or school systems and validate such measures against student outcomes. The Institute's intent is to provide education leaders and administrators with instruments that will enable school or district staff to assess specific aspects of school organization or management along dimensions that matter to (i.e., are strongly correlated with) student outcomes. As an illustration of the type of instrument the Institute seeks, an applicant might cull from existing research a set of specific practices that have been, or potentially could be, shown to be highly correlated with student achievement outcomes. These practices would need to be operationalized at a relatively specific level. For example, an overarching category might be "maintains a strong teaching and learning environment" and include subcategories such as, academic goals, student progress monitoring, and classroom instruction. Items for each subcategory (e.g., student progress monitoring) would address specific practices or behaviors that are used to meet the objective of that subcategory (e.g., teachers follow an established schedule for monitoring student progress on learning goals; progress monitoring data are used to identify students who are falling behind grade-level expectations; teachers use progress monitoring data to modify instructional programs for individual students). For the Goal Five measurement project, the applicant would propose to develop this instrument and then conduct a study to validate the instrument against relevant school and student academic outcomes.

C. Specific Requirements

a. Submission to a specific goal

For the Policy/Finance topic, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. More details on the requirements for each goal are listed in Part III Requirements of the Proposed Research. Goal Five (Measurement) applications to develop and validate measures of the organization and operation of schools or school systems should refer to the Requirements for Goal Five (Measurement Projects) under Part III. However, the requirements for Goal Five (Measurement) applications that address cost-accounting tools are listed in section 10.C.c

Requirements for Policy/Finance Goal Five 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 33 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, applications must address

- malleable factors (e.g., practices, programs, policies) that are associated with student outcomes for the purpose of identifying potential targets of intervention for students from kindergarten through high school; or
- mediators or moderators of the relations between malleable factors relevant to education policies, systems, or finance and student outcomes for the purpose of identifying potential targets of intervention; or
- policy, finance, or systems-level interventions intended to improve student outcomes (e.g., reading, mathematics, attendance, graduation rates) directly or indirectly for education systems that include kindergarten through high school; or
- 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; or
- measures of the organization and operation of schools or school systems that are intended to be used by education leaders and administrators and to be correlated with student outcomes.

Under the Policy/Finance program:

- Applicants under Goal Three and Goal Four must provide measures of student academic outcomes.
- 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).

Applicants interested in systems-level policies or programs at the prekindergarten level should refer to the Early Childhood Programs and Policies topic.

c. Requirements for Policy/Finance Goal Five cost-accounting applications

The requirements described in this section apply only to Policy/Finance Goal 5 applications that address cost-accounting tools. Policy/Finance Goal 5 applications that address practical measures of the organization and operation of schools or school systems should follow the requirements listed under Goal 5 in section III.17.F Requirements for Goal 5.

(i) Requirements of proposed measurement tools.

Under the Education Policy, Finance, and Systems topic, the purpose of Goal Five is 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 that are analogous to cost accounting systems used in business accounting, which are based on generally accepted accounting principles. The proposed development of the cost accounting tools should be

supported by strong rationale or theory. 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. Developers of such tools should take into account the need for education administrators and policymakers to be able to determine the excess costs of educating students with special needs (e.g., English language learners, students with disabilities) in specific categories of expenditure.

The Institute recognizes that because the critical determinants of achievement may be, for example, *which* curriculum was purchased and *not* the amount that was spent on the curriculum (or what type of professional development and not the amount that was spent on the professional development, and so on), the Institute encourages the development of cost accounting systems that allow administrators to track such decisions along with the financial data. 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 Goal Five will be $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.

11. EARLY CHILDHOOD PROGRAMS AND POLICIES

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

A. Purpose

Through its Early Childhood Programs and Policies (Early Childhood) 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[13] (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, and 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.

The Institute encourages researchers to explore malleable factors (e.g., instructional practices, policies, teacher skills) that are associated with better school readiness 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. This is translational research intended to inform the development of

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

innovative programs, practices, or products to improve child outcomes. One approach to the exploration of malleable factors is for researchers to conduct detailed, quantifiable observations of early childhood teacher practices (types of instruction, frequency, duration, under what circumstances), and then use the instructional data in conjunction with child characteristics to predict subsequent school readiness. The goal here is to identify what type or combination of instructional activities is associated with better child outcomes and for which students. Researchers who can identify strong correlates of child outcomes could use this information as the basis for developing an intervention.

The Institute is interested in the development of innovative programs and practices intended to improve young children's pre-reading, pre-writing, language and vocabulary, and early science and mathematics skills, as well as research to evaluate the impact of such programs and practices to determine if they actually improve student outcomes. The Institute also encourages research on the development and evaluation of programs and practices intended to improve young children's socio-emotional readiness. 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.

Currently many states are considering the costs and benefits of different early childhood policies, such as (a) universal prekindergarten programs versus targeted prekindergarten programs; (b) full-day prekindergarten programs versus half-day prekindergarten programs; and (c) one-year programs (i.e., for four-year-olds) versus two-year programs (i.e., for three- to five-year-olds). The Institute encourages proposals that address these and other important systems-level issues including (a) financing early childhood programs (e.g., are there more efficient and effective ways to coordinate funding streams?); (b) alignment of state early learning standards with kindergarten to grade 12 standards; (c) assessment of children's kindergarten readiness (e.g., what should be assessed or what is predictive of later school achievement?); and (d) teacher certification requirements (what criteria are predictive of child outcomes?).

Under the Early Childhood program, the Institute 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. Although some existing tests of pedagogical knowledge and subject matter knowledge have been correlated with the test takers' SAT or ACT scores, validation of existing tests against measures of school readiness remains to be accomplished (Gitomer, Latham, and Ziomek 1999). Hence, the Institute is interested in proposals to *validate existing measures* of pedagogical knowledge and subject matter knowledge against measures of school readiness as well as proposals to *develop and validate new measures.* Assessments of teacher pedagogical and subject matter knowledge that are strongly correlated with student outcomes could form the basis for an improved system of certification and for determining the effectiveness of professional development activities. The Institute also invites applications to develop and/or validate measures of instructional 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.

Under the Early Childhood program, the Institute intends to support the development and/or validation of assessments of school readiness, pre-reading, pre-writing, language and vocabulary, early mathematics, early science, and social skills. Such assessments could be used to monitor progress in these domains and/or for purposes of screening for school readiness. 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 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 Early Childhood research program, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 Childhood 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 33 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 Childhood program, applications must address

- malleable factors that are associated with school readiness outcomes for the purpose of identifying potential targets of intervention;
- mediators or moderators of the relations between malleable factors and school readiness for the purpose of identifying potential targets of intervention; or
- curricula or instructional practices in pre-reading, pre-writing, early mathematics, early science, or social skills intended to prepare young children for school and designed to be used in center-based prekindergarten settings;
- assessment of prekindergarten children's pre-reading, pre-writing, early mathematics, early science, or social skills;
- teacher professional development training related to school readiness;
- assessments of teacher subject matter knowledge, pedagogical knowledge, or instructional practices for prekindergarten teachers; or
- state or local policies that apply to the implementation or improvement of early childhood programs and initiatives.

Under the Early Childhood program:

- All applicants under Goal Three and Goal Four must provide measures of children's school readiness outcomes.
- The Institute is primarily interested in programs and policies intended to improve school readiness for children who are at-risk for later school failure. The focus of the Early Childhood program is on center-based programs and policies for prekindergarten children (three- to five-year-olds).

12. MIDDLE AND HIGH SCHOOL REFORM

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

A. Purpose

The purpose of the Institute's education research program on Middle and High School Reform (Middle/High School) is to support research on approaches, programs, and practices that enhance the potential of at-risk students to complete high school with the skills necessary for success in the workplace

or in postsecondary education. The Middle/High School research program complements the Institute's existing research programs on teacher quality, reading and writing, interventions for struggling adolescent and adult readers, mathematics and science education, education leadership, and policy and systems, each of which includes middle and high school education. Although these research programs include research on interventions appropriate for middle and high schools, the Middle/High School education research program is different from these research programs in three ways. First, it focuses exclusively on improving educational outcomes in middle schools and high schools. Second, it focuses on a particular population—students who are at-risk of dropping out of high school or who finish high school without the skills necessary to be ready for the demands of the workplace or college. Third, it focuses on approaches, strategies, and interventions that are intended to supplement, complement, intensify, or in some sense, act as a catalyst to increase the benefit at-risk students would otherwise derive from their academic coursework. In other words, for the Middle/High School research program, the Institute is interested in approaches that can augment the effects of better instruction and higher quality teachers in the core academic subjects (e.g., double-blocking, structural reforms) and thereby, better serve the needs of students who are poorly prepared academically and motivationally for the demands of high school.

The Middle/High School research program addresses five goals: (1) exploring malleable factors[14] (e.g., interventions, systemic programs) 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 middle or high school reform interventions that are intended to increase the likelihood that at-risk students will complete high school with the skills necessary for success in the workplace or in postsecondary education; (3) evaluating the efficacy of fully developed middle or high school reform interventions with small efficacy or replication trials; (4) evaluating the impact of middle or high school reform interventions that are implemented at scale; and (5) developing and/or validating assessments of students' non-academic behaviors (e.g., timeliness, responsibility, persistence, discipline, initiative, social competence) that could be used by teachers to evaluate students on skills that are potentially important for future education or employment.

The long-term goal of the Middle/High School research program is to provide an array of effective middle and high school reform practices that have been shown to be effective for improving student outcomes. This research program is designed to support crosscutting reform efforts.

B. Background

Improving high school students' academic achievement and graduation rates is of national concern. According to the most recent National Assessment of Educational Progress, only 36 percent of twelfth grade students read at or above the proficient level, and only 26 percent write at or above that level. Similarly for mathematics, only 16 percent of grade 12 students scored at or above the proficient level, and only 18 percent for science. Low levels of academic achievement in high school affect postsecondary education. According to the National Center for Education Statistics, in 2000, 28 percent of college freshmen took at least one remedial course in reading, writing or mathematics. Further, the ACT reports that in the class of 2004, only 26 percent of high school students who took the ACT college entrance exam had scores predictive of earning a "C" or higher in college algebra.[15] Across the board, low levels of achievement are more likely among minority groups and students from low-income backgrounds than among students from advantaged backgrounds.

More problematic than the generally low levels of academic achievement in grade 12 are the large numbers of students who do not complete a high school diploma. In 2004–05, the averaged freshman

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

[15] Accessed on January 26, 2009 at http://www.act.org/news/releases/2004/10-14-04.html.

graduation rate[16]—an estimate of the percentage of a freshman class that graduates—across states and the District of Columbia ranged from 57 percent to 85 percent, and was 75 percent for the nation as a whole (Planty et al. 2008).

Although rigorous research on high school reform is meager, there are a few findings and developments that point the way toward approaches, strategies, and practices that could benefit from an intensive research and development effort through the Institute's Middle/High School research program. These include but are not limited to (a) closer monitoring of student academic progress, (b) more demanding course requirements in high schools and middle schools, (c) academic and career-related academies, (d) mentoring, (e) alternate remediation strategies, (f) positive incentives, and (g) alternative schools and additional opportunities for high school completion.

A combination of intervention strategies targeted to academic needs and designed to engage and strengthen students' existing interests and skills is likely to be critical to enhancing the probability that at-risk youth will complete high school with the skills needed for the workplace, college, or the military. For example, the Institute encourages applications to develop and evaluate promising academic remediation programs that cover reading, mathematics, and other basic academic skills, including programs that begin in middle school and are intended to better prepare and support the transition of at-risk students into high school. In addition, the Institute encourages research on the availability of rigorous coursework (e.g., Advanced Placement or International Baccalaureate courses), or increased requirements in mathematics and science and the impact of such practices and policies on high school completion and dropout rates, school achievement, and college enrollment, particularly among students at-risk for failure in high school. For example, when districts have policies requiring algebra or higher for all ninth-graders, what are the most effective ways to enable under-prepared students to complete ninth grade algebra (e.g., double-blocking math courses, summer school)?

The issues of student accountability and achievement monitoring permeate discussions of high school reform. For example, there is accumulating evidence suggesting that when high school exit exams are in place, schools and districts cover more of their state content standards, align their curricula and instruction with such standards, and are more likely to provide remedial instruction and other interventions designed to help students at-risk of failing (Wise et al. 2003). The Institute encourages applications proposing, for instance, interrupted time series analyses to examine the potential effect of high school exit examinations on high school completion and dropout rates, college enrollment, and academic achievement. In addition, the Institute is interested in applications to develop, implement, and assess the impact of using well-designed benchmark assessments to track academic progress toward state achievement standards.

Evidence on the effectiveness of programs that put careers and occupation-oriented knowledge at the center of high school life is mixed. There is a need for research on the conditions under which career and technical education can enhance the potential for at-risk students to complete high school with the skills needed to be successful in the workplace, college, or the military. A number of new directions have been proposed that have not been subjected to rigorous research or evaluation, such as dual enrollment/credit programs that permit students to obtain college-level credits or provide the opportunity to earn an industry-recognized credential while still in secondary school.

Incentives that encourage high school completion take many forms, ranging from "No pass, no play" laws that make participation in extracurricular activities contingent on passing all courses to cash rewards or gift certificates for school completion. Although there is some evidence of the potential benefit of such interventions in other countries, research is needed on the effects of various types of incentives on high

[16] The averaged freshman graduation rate is an estimate of the percentage of a freshman class that graduates on time. It is based on calculating the average of (a) the number of eighth-graders five years prior to the graduation date, (b) the number of ninth-graders four years prior to the graduate date, and (c) the number of tenth-graders three years prior to the graduation date, and then determining the percentage of the "averaged freshman class" that graduates on time.

school completion and academic achievement in the United States and the conditions that may moderate the impact of such incentives.

Mentoring provides an individualized intervention with an adult who helps with many aspects of a student's life—academic, social, work, personal. Mentoring is a central component of a number of programs that are intended to enhance high school success for at-risk students. For example, Check and Connect, a dropout prevention program for youth with disabilities, increased ninth grade course completion rates and student engagement for special education students (Sinclair et al. 1998). Empirical questions remain about the kind of training, levels of intensity, and cost-effective ratios of mentors to students needed to affect dropout/completion behavior and academic achievement.

Alternative education programs for high school students are commonplace in today's school systems. Schools and programs have been developed with the understanding that some students need more than what a traditional high school experience can provide and may incorporate curriculum modifications, schools within a school, flexible schedules (including evening and weekend classes), small class sizes, individualized instruction, vocational counseling, social service linkages, tutoring, mentoring, and/or parent involvement programs. Given the limited research base, evaluation of alternative education programs and schools as "interventions" for at-risk students would contribute to our understanding of the costs and benefits of such programs (and their components), with outcomes of interest including: academic achievement; disciplinary problems; school attendance, engagement, and connectedness; and high school completion or GED attainment.

The Institute invites applications to develop and validate measures of students' non-academic behaviors (e.g., timeliness, responsibility, persistence, discipline, initiative, social competence) that could be used by teachers to evaluate students. Such evaluations could be incorporated into student transcripts and provide students with a way to document growth and development in skills that are potentially important for future education or employment. Applications to develop and/or validate such instruments are appropriate for Goal Five. Individuals interested in examining the impact of such assessments on students or institutions, or the relation between implementation of the assessments and student/institutional outcomes should consider Goals One, Two, Three, or Four.

C. Specific Requirements

a. Submission to a specific goal

For the Middle/High School research program, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 Middle/High School 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 33 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 Middle/High School research program, applications must address

- malleable factors relevant to middle school reform that are associated with successful transition of students into high school for the purpose of identifying potential targets of intervention; or
- malleable factors relevant to high school reform that are associated with successful completion of high school and/or preparation for postsecondary education or the workplace for the purpose of identifying potential targets of intervention; or

- mediators or moderators of the relations between malleable factors relevant to middle or high school reform and student outcomes for the purpose of identifying potential targets of intervention; or
- interventions implemented in high schools in which the intent of the program is to support successful completion of high school and preparation for postsecondary education or the workplace; or
- interventions implemented in middle schools where the intent of the program is to support the transition into high school; or
- assessments of non-academic behaviors (e.g., timeliness, engagement, responsibility, persistence, discipline, initiative, social competence) that could be used by teachers to evaluate middle or high school students on behavioral dimensions that are potentially important for future education or employment.

Under the Middle/High School research program:

- The Institute defines middle school and high school reform interventions as interventions that are intended to supplement, complement, intensify, or in a sense, act as a catalyst to increase the benefit that students would otherwise derive from their core academic coursework.
- Applicants must address middle or high school reform approaches that are intended to increase the possibility that academically at-risk students will be more likely to successfully transition into high school or from high school into postsecondary education or employment.

13. INTERVENTIONS FOR STRUGGLING ADOLESCENT AND ADULT READERS AND WRITERS

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

A. Purpose

Through its research program on Interventions for Struggling Adolescent and Adult Readers and Writers (Adolescent/Adult Readers), the Institute intends to contribute to the improvement of reading and writing skills among struggling adolescent and adult readers and writers by (1) exploring malleable factors[17] (e.g., instructional practices, curricula) that are associated with better reading or writing outcomes for struggling adolescent and adult readers and writers, as well as mediators and moderators of the relations between these factors and reading or writing outcomes, for the purpose of identifying potential targets of intervention; (2) developing innovative curricula and instructional practices for teaching reading or writing to struggling adolescent and adult readers or writers, or for addressing the underlying causes of their reading or writing difficulties; (3) evaluating the efficacy of curricula and instructional practices for improving reading or writing skills of struggling adolescent or adult readers and writers; (4) evaluating the impact of reading or writing curricula and instructional practices for struggling adolescent and adult readers and writers when implemented at scale; and (5) developing and validating assessments that can be used in instructional settings to support instruction of struggling adolescent and adult readers and writers.

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 the reading and writing skills of struggling adolescent and adult readers and writers.

B. Background

A significant number of adolescent and adult readers are not able to read well enough to make sense of short passages, much less the longer stretches of text that most readers are expected to understand everyday. On the 2007 National Assessment of Educational Progress (NAEP), 26 percent of eighth-

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

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 adolescents could not 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. Studies show that adolescents who are struggling readers are at high risk of dropping out of high school, graduating unprepared for college, and having limited opportunities in the workforce (National Center for Education Statistics 2003).

Although the research base on the basic components of literacy and strategies to help young children learn to read is strong, much less research has examined how to identify, prevent, and remediate reading difficulties in middle and high school students (Snow, Burns, and Griffin 1998). Some middle and high school students struggle with basic reading skills, such as decoding and word recognition. Other adolescent students have learned basic reading skills, but struggle with components that are key to making sense of the texts encountered in middle and high school: vocabulary, fluency, and comprehension.

Similarly, the 2003 National Assessment of Adult Literacy finds that 14 percent of adults have 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 demonstrates basic prose literacy skills, but cannot 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 such individuals are currently unemployed.

In a recent analysis of the writing skills of U.S. adolescents (Graham and Perin 2007), the authors argued that the ability to write well is as important as the ability to comprehend complex text. On the 2007 National Assessment of Education Progress, 68 percent of eighth-graders, and 75 percent of twelfth-graders scored at the Basic or Below Basic level in writing proficiency. These performance levels reflect the perception of postsecondary instructors and employers that many adolescents do not write well enough to succeed in college or the workplace.

Given that substantial numbers of adolescents and adults struggle with the basic tasks of reading and writing, the Institute requests applications targeting the development and evaluation of reading and writing interventions and assessments designed for struggling adolescent and adult readers. By struggling adolescent readers and writers, the Institute means those middle or high school students who have not been identified with disabilities, but whose reading or writing skills are at least two years below grade level. By struggling adult readers and writers, the Institute refers to adults whose reading and writing skills prevent them from carrying out simple daily tasks. Struggling adolescent and adult readers/writers typically have received reading and writing instruction during their schooling, but performed below grade-level expectations. The Institute is particularly interested in research efforts targeting adolescents and adults who may able to read and/or write at some minimum level, but whose performance level impedes their success either in the classroom or workplace. For example, adolescent students may not qualify for special education services, but their performance levels indicate a need for additional reading and/or writing instruction.

Through this program, the Institute intends to support research on the development of innovative interventions that are appropriate for use in middle and high school and/or adult basic education programs. Appropriate interventions include curricula and instructional approaches for struggling adolescent or adult readers and writers. The Institute will also support research to evaluate the impact of such interventions to determine if they actually improve reading or writing outcomes for struggling adolescent or adult learners.

The Institute encourages researchers to explore malleable factors (e.g., curricula, instructional practices) that are associated with better reading or writing outcomes, as well as mediators and moderators of the relations between these factors and reading or writing 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 reading or writing outcomes. One approach to the exploration of malleable factors is for researchers to conduct detailed, quantifiable observations of reading or writing instruction (types of instruction, frequency, duration, under what circumstances), and then correlate the instructional data with reading or writing performance. The goal here is to identify what type or combination of instructional activities is associated with better student outcomes. Researchers following this strategy who can identify strong correlates with student performance could use this information as the basis for developing an intervention.

The Institute also intends for the Adolescent/Adult Readers program to address the need to develop and validate reading and writing measurement tools for classroom assessments to be used for instructional purposes (e.g., progress monitoring). To improve reading and writing 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. Through Goal Five, the Institute intends to support the development of diagnostic assessments in reading and writing and assessments to monitor progress in reading and writing.

C. Specific Requirements

a. Submission to a specific goal

For the Adolescent/Adult Readers research program, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 Adolescent/Adult Readers/Writers 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 33 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 Adolescent/Adult Readers/Writers program, applications must address

- malleable factors that are associated with reading or writing outcomes for struggling adolescent or adult readers or writers for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors and reading or writing outcomes for struggling adolescent or adult readers or writers for the purpose of identifying potential targets of intervention; or
- reading or writing curricula for teaching reading or writing to struggling adolescent or adult readers or writers or for addressing the underlying causes of their reading or writing difficulties; or
- instructional approaches for teaching reading or writing to struggling adolescent or adult readers or writers or for addressing the underlying causes of their reading or writing difficulties; or
- reading or writing assessments to support instruction intended for use with adolescent and adult readers and writers.

14. ENGLISH LANGUAGE LEARNERS

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

A. Purpose

Through its research program on English Language Learners (ELL), 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 language learners by: (1) exploring malleable factors[18] (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 ELL students (e.g., curriculum, instructional practices, programs, and policies) designed to improve outcomes for ELL students; (3) evaluating fully developed interventions for ELL students through efficacy or replication trials; (4) evaluating the impact of interventions for ELL students that are implemented at scale; and (5) developing, revising, and validating assessments for use with ELL 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 ELL students.

B. Background

Children who speak a language other than English at home[19] 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 children has increased from 3.8 to 10.8 million, representing 20 percent of the current school-age population in the United States.[20] 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 Language Learners (ELLs) (Hoffman and Sable 2006).

On the 2007 National Assessment of Educational Progress (NAEP), 70 percent of fourth-graders and 70 percent of eighth-graders identified as ELLs scored below the basic level in reading. In contrast, among non-ELL 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, with 44 percent of fourth-graders and 69 percent of eighth-graders identified as ELLs scoring below the basic level in Math, compared to 15 percent of non-ELL fourth-graders and 26 percent of non-ELL eighth-graders.

Through its research program on English Language Learners, the Institute intends to support research on the development and evaluation of interventions that are appropriate for use from kindergarten through grade 12 and in postsecondary vocational education programs or adult basic education programs that

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

[19] 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 language 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 language 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.

[20] 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.

serve English language learners. By English language 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 language learners.

The Institute encourages researchers to explore 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. This is translational research intended to inform the development of innovative programs, practices, or products to improve student outcomes. One approach to the exploration of malleable factors is for researchers to conduct detailed, quantifiable observations of instructional practices (types of instruction, frequency, duration, under what circumstances), and then use the instructional data in conjunction with child characteristics to predict subsequent school outcomes. The goal here is to identify what type or combination of instructional activities is associated with better child outcomes and for which types of ELL students. Researchers who can identify strong correlates of child outcomes could use this information as the basis for developing an intervention.

The Institute is interested in the development of innovative programs and practices intended to improve ELL 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 and/or evaluating interventions, the Institute encourages researchers to consider how the different conditions under which ELL students receive their schooling may affect the implementation and impact of various strategies. For example, how does the proportion of ELL 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 ELL students? In some areas, ELL students primarily represent one language group (e.g., Spanish); in other areas, ELL students represent a number of different language groups (e.g., Chinese, Hmong, Spanish, and Vietnamese). The Institute seeks applications for research on older ELL 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 ELL students, as well as applications for research on younger ELL students (e.g., those entering the U.S. school system in kindergarten or elementary school).

Under the ELL program, the Institute also intends to support the development and/or validation of assessments for ELL 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 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 ELL research program, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 ELL 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 33 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 ELL program, applications must address

- malleable factors that are associated with school outcomes for the purpose of identifying potential targets of intervention for ELL students; or
- mediators or moderators of the relations between malleable factors and school outcomes for the purpose of identifying potential targets of intervention for ELL students; or
- curricula or instructional practices in reading, writing, mathematics, or science intended to improve academic outcomes for ELL students; or
- assessment of reading, writing, mathematics, or science for ELL students; or
- teacher professional development training related to instruction for ELL students; or
- assessments of teacher pedagogical knowledge or instructional practices for teachers who teach ELL students; or
- state or local policies that apply to the implementation or improvement of ELL programs and initiatives.

Under the ELL program:

- Applications relevant to reading, writing, or mathematics education must be for ELL students from kindergarten through high school; or for ELL students in adult and vocational education programs; or for ELL students in developmental/bridge programs designed to help under-prepared students acquire the skills to succeed in college.
- Applications relevant to science education must be for ELL students from kindergarten through high school.
- All applicants under Goal Three and Goal Four must provide measures of student outcomes.
- The Institute is primarily interested in programs and policies intended to improve school outcomes (learning in reading, writing, mathematics, or science, graduation rates, access to postsecondary education) for ELL students.

15. POSTSECONDARY EDUCATION

Program Officer: Dr. Ram Singh (202-219-2025; Ram.Singh@ed.gov)

A. Purpose
The Institute intends for the Postsecondary Education research program to address five goals: (1) exploring malleable factors[21] (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

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

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.

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 and 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. The types of projects that are appropriate for this program are illustrated by, but not limited to, the examples provided below.

In recent years, a number of innovative programs for improving access to postsecondary education have been implemented. For example, the California State University system has partnered with California's Department of Education and State Board of Education to develop the Early Assessment Program for high school students. Through the Early Assessment Program, students in grade 11 are assessed in English and mathematics to determine their readiness for college-level coursework. Students can use the results of the test to identify skills that they need to work on during their senior year in order to be better prepared for college. Nationwide, 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. However, little rigorous research exists to evaluate the impact such programs have on college enrollment and persistence.

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). Some programs target freshmen in their first two semesters; other programs may be designed as intensive programs the summer prior to the freshman year. The Institute encourages applications to test the impact of such programs on students' grades, retention, and graduation. Some institutions have policies designed to identify and provide support to students who are struggling early on. Such policies include mandatory roll-taking policies that require (a) instructors to contact students' advisors when students miss a specified number of classes, and (b) advisors to follow-up with students, or policies that require instructors to inform advisors early in

the semester if the student is failing so that advisors can be proactive about providing assistance to struggling students. The Institute invites applications to examine the impact of such programs on student retention and graduation.

The Institute encourages research on interventions to provide students and parents with information that may be related to students' choices regarding whether to go to college and where to go to college. According to the National Center for Education Statistics, both high school students and their parents are likely to markedly overestimate the cost of tuition and fees for one year of college (Horn, Chen, and Chapman 2003). Further, among households in the lowest income groups, parents are more likely to report that they are not able to estimate the cost of tuition and among those who do estimate the cost, they are less likely to be within 25 percent of the actual average tuition cost for the type of institution in their state that their student wanted to attend. 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.

A number of states have implemented merit-based scholarship programs intended to provide students with an incentive to perform well in high school and attend college. For example, in 1993, Georgia introduced the Georgia Hope Scholarship program, which covers tuition, allowable mandatory fees, and a book allowance in public colleges to Georgia high school graduates with a B average or better, or a voucher of equal value for students who choose to attend private college. Continued receipt of the scholarship is contingent upon satisfactory academic progress. The introduction of the program was associated with increases in four-year public and private college attendance among young adults residing in Georgia (Cornwell, Mustard and Sridhar 2005). The Institute is interested in supporting rigorous evaluations of such programs.

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.

Policymakers and higher education administrators seek answers to practical questions regarding the relative impact - both costs and benefits - of alternative approaches to student financial aid on access to and completion of postsecondary education for a wide range of student groups (e.g. traditional, nontraditional, economically disadvantaged). Applicants might consider, for example, the impact of loan financing or loan forgiveness on college completion of at-risk students, or whether extending grant aid eligibility to high school students would spur development of dual enrollment programs and increase college enrollment of at-risk students. As another example, investigators might compare the impact of student financial aid policies (e.g., alternative methods for calculating student financial aid eligibility, the use of merit versus need based criteria for student financial aid) on access to and completion of postsecondary education. Applicants might also examine how the interactions of student financial aid and student support services affect access to and completion of postsecondary education. All 50 states offer tax-deferred plans for saving for college (529 plans) and some states have college saving plans that guarantee full-tuition payment in the future. Who is utilizing these programs? What is the impact of such programs on access to postsecondary education? The Institute also invites rigorous research on new and existing federal and state financial aid programs intending to encourage students from low income families to prepare for, enroll in, and succeed in postsecondary education.

Finally, 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 Goal Five under this topic.

C. Specific Requirements

a. Submission to a Specific Goal

For the Postsecondary Education Research program, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 33 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, applicants must address

- malleable factors that are associated with increased access to, persistence in, or completion of postsecondary education for the purpose of identifying potential targets of intervention; or
- mediators or moderators of the relations between malleable factors and increased access to, persistence in, or completion of postsecondary education for the purpose of identifying potential targets of intervention; or
- interventions 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; or
- measures of learning at the postsecondary level (e.g., college-level proficiencies in reading, writing, critical thinking, and mathematics) that could be used broadly by institutions of higher education to assess what students have learned in college.

16. 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.

Under the Institute's Education Technology research program, researchers are invited to propose rigorous research projects to develop and evaluate innovative education technology tools or evaluate existing 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; (b) to teach basic reading, writing, mathematics, or study skills at the postsecondary level, including vocational education and adult education; and (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.

Researchers may choose to develop innovative technology that is intended (a) to provide or support instruction to students (e.g., intelligent tutors, online courses for advanced high school science and mathematics courses), (b) to deliver professional development for teachers, or (c) to assess student learning. Through this program, the Institute will also support research to evaluate the impact of such products to determine if they actually achieve their intended goals and can improve student outcomes. The Institute 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 relevant student outcomes (e.g., reading or mathematics achievement). The Institute encourages applicants to read its report on the evaluation of education technology products.[22]

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 *either* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. 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 officer listed in Section 33 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 research program, applicants must address

- education technology interventions designed to improve student outcomes in reading, pre-reading, writing, pre-writing, mathematics, science, or study skills; or
- education technology assessments to support instruction in reading, pre-reading, writing, pre-writing, mathematics, science, or study skills from prekindergarten through high school or to support teaching basic reading, writing, or mathematics skills to adults.

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 level, 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 (e.g., instruction in organization, audience, style, and writing clear prose) at the college level (note: proposals to

[22] *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.

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 or students in programs for under-prepared college students.
- 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.
- Under Goal Three and Goal Four, applicants proposing teacher professional development interventions must include measures of student academic outcomes.
- 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.

PART III REQUIREMENTS OF THE PROPOSED RESEARCH

17. 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 2010 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 2010 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.

c. Applying to multiple topics

Applicants may submit proposals to more than one of the Institute's FY 2010 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 25, 2009 deadline may not submit the same or a very similar proposal to the October 1, 2009 deadline.

d. Applying to a particular goal within a topic

For the FY 2010 Education Research Grants Programs, applicants must submit under *either* Goal One *or* Goal Two *or* Goal Three *or* Goal Four *or* Goal Five. The numbering of goals is consistent across the Institute's research programs. 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, 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 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 33 if they have any questions regarding the appropriateness of a particular project for submission under a specific goal.

B. Requirements For Goal One (Exploration Projects)

Because the requirements for Goal One 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 Goal One (Exploration)
Through all of its research programs that include the Exploration goal (Goal One), 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, 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 Goal One 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 Goal One projects could be used to inform the development of interventions in a subsequent Goal Two (Development) 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. Goal One 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 Goal Three.

Another purpose of Goal One projects is to examine mediators or moderators of education interventions for the purpose of informing modification of existing education interventions or development of new interventions in a subsequent Development project. For example, child gender 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 Goal One including, but not limited to, original data collection with appropriate statistical analyses and secondary data analyses of existing datasets. 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 and 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).[23]

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 Goal Three (Efficacy/Replication) and Goal Four (Scale-up Evaluations) 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 Goal Three. Under Goal One, 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 school system, or (d) draw conclusions about the efficacy or effectiveness of education interventions.

At the end of a Goal One project to explore underlying processes or to examine mediators and moderators of education interventions, the researcher should be able to use the results of their studies to generate a well explicated theory of action that can be used to inform the development or modification of an intervention under Goal Two. At the end of a Goal One 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 Goal Three.

b. Significance of the project

By addressing (a) the theoretical and empirical rationale for the study and (b) the practical importance of the variables (malleable factors, mediators, moderators) that will be examined, Goal One applicants are addressing the significance of their proposal.

c. Methodological requirements

For all applications, including those submitted under Goal One, 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) Data sources.

Applicants proposing secondary data analyses should describe clearly the database(s) to be used in the investigation including information on sample characteristics, variables to be used, and ability to ensure access to the database if the applicant does not already have access to it. The database 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 database. If multiple databases 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 databases needed for the study, the applicant should provide sufficient documentation (e.g., letters of

[23] 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.

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. In particular, applicants should provide sufficient information on the construct validity of the proposed measures. For example, if the applicant proposes to use a state database 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 database 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).

Applicants may propose a Goal One project in which the primary focus is on the collection and analysis of original data. The applicant should carefully describe the sample, 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 an existing database 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 database, the measures to be used (including information on the reliability and validity of the proposed instruments), and data collection procedures.

(iii) 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, the Institute expects investigators to 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. 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.

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 access to schools in which to conduct the 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 Goal Two (Development And Innovation Projects)

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

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 (but untested) theory of change for the intervention, 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, data addressing the feasibility of its implementation in an authentic education delivery setting, and pilot data addressing the promise of the intervention for generating outcomes the intervention is designed to effect. 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. The promise of the intervention for achieving outcomes could be addressed, for example, by demonstrating better outcomes for participants with successive iterations of the intervention, better outcomes associated with more participant exposure to the intervention, normatively rare outcomes consistent with the goals of the intervention, post-intervention scores on an outcome measure that are substantially higher than pre-intervention scores on that measure, or data demonstrating that implementation of the intervention is associated with changes in activities and behaviors that are consistent with the theory of change underlying the intervention. The Institute anticipates that investigators with successful development projects would submit proposals to subsequent competitions for Goal Three (Efficacy/Replication) awards. The data on feasibility of implementation and pilot data on the promise of positive outcomes to be collected under a Goal Two

(Development) 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 Goal Two, 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 the question: *Why is the proposed intervention likely to produce better student outcomes relative to current education practices?*

By describing (a) the context for the proposed intervention; (b) the intervention (e.g., features, components), including its theory of change and the theoretical and empirical support for the proposed intervention; and (c) the practical importance of the intervention, Goal Two applicants are addressing aspects of 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. 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)?

c. Methodological requirements

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

The primary purpose of Goal Two projects is the development of interventions. For Goal Two projects, applicants must clearly address the proposed methods for developing the intervention and testing the feasibility of implementation of the prototype in an authentic education delivery setting. Applicants should describe the systematic process they will use to collect empirical data that will provide feedback for refining the intervention. A major objective of Goal Two 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.

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 (see Goal Three).

(i) Sample.

The applicant should define, as completely as possible, the samples and settings that will be used to assess the feasibility of the intervention and for the pilot data assessing the promise of the intervention.

(ii) Iterative development process.

Applicants should describe the 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 often a helpful way of showing reviewers how research activities will feed into subsequent development (refinement) activities, so that information can be used to make decisions and improvements. A variety of methodological strategies may be employed during this phase. For Development 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 Goal Two project, the Institute expects investigators to have a fully developed intervention and data that address the feasibility of implementing the intervention in authentic education delivery settings as well as the promise of the intervention for generating outcomes

the intervention is designed to effect. 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 Goal Two project, the Institute also expects investigators to have evidence of the promise of the intervention for achieving the intended outcomes. Such evidence could include pilot data demonstrating that performance on outcome measures is progressing in the appropriate direction (e.g., students' post-intervention scores on a curriculum-based test are substantially higher than pre-intervention scores) or pilot data demonstrating that implementation of the intervention is associated with changes in activities and behaviors that are consistent with the theory of change underlying the intervention. Whatever pilot data are proposed, applicants should be aware that (a) 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 (b) the review of methodological requirements will focus on methods for developing the intervention as detailed below. The pilot data are 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). Goal Two 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 in order to determine if the intervention is operating as intended and (b) how those observations will be collected. Observational, survey, or qualitative methodologies are encouraged to identify conditions that hinder implementation of the intervention.

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 a 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 developed interventions to move to efficacy evaluations. 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, and (c) indicate whether what was developed has been (or is being) evaluated for efficacy (Goal Three) and if results are available, what the results of those efficacy evaluations have been.

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 data from their prior development award or other data indicate 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 and 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 Goal Two, 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 Goal Three (Efficacy And Replication Projects)

Because the requirements for Goal Three 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 Goal Three, 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 Goal Three (Efficacy and Replication)

Through all of its research programs that include the Efficacy and Replication goal (Goal Three), 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 language learners). Results from efficacy projects have less generalizability than results from scale-up evaluations under Goal Four. 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 Goal Three, 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).

Applicants should use the efficacy and replication trials to determine the conditions, if any, under which an intervention produces meaningful improvement of academic outcomes. For example, if a research team hypothesized that a variation in the delivery of the program would improve the impact of an intervention, the team might propose to randomly assign (a) one-third of the classrooms to the basic intervention; (b) one third of the classrooms to the variation; and (c) one-third of the classrooms to continue with standard district practices. Efficacy and replication trials can be used to examine the conditions that support or hinder good implementation of an intervention.

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.

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 education sciences.

b. Significance of the project

Interventions appropriate for study under Goal Three 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 Goal Three 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 (a) the fully developed intervention (e.g., features, components), (b) the rationale for evaluating the proposed intervention, and (c) the theory of change for the intervention, Goal Three applicants are addressing aspects of 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 to 9 months) to develop measures, 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 Goal Two. Goal Three 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) Rationale for interventions that are already in wide use.

Applicants should provide a compelling rationale that justifies the Institute's investment in the evaluation of the 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.

(iii) Rationale for 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 rationale of 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) research on related interventions or components of the intervention; and (c) appropriate empirical evidence. Appropriate empirical evidence include, but are not limited to, evidence of the feasibility of implementation of the intervention and data on outcomes for participants in the intervention that are consistent with the intended effect of the intervention, for example, on a change in scores from pretest to posttest in the direction and magnitude that the intervention is designed to generate.

In essence, the applicant needs to address the question: Why is this intervention likely to produce better student outcomes relative to current practice? In addition, applicants should address the *practical* importance of the intervention. For example, is the intervention sufficiently comprehensive to improve student outcomes on end-of-year assessments? Is there evidence indicating that the intervention is sufficiently different from current practices to potentially improve student outcomes relative to current practices?

(iv) 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?).

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.

c. Methodological requirements

For all applications, including those submitted under Goal Three, 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.[24]

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).[25] 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 datasets 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

[24] 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.

[25] 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.

effect, applicants should indicate clearly (e.g., by including the statistical formula) how the effect size was calculated.

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.).[26] 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 interest to educators. 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. In addition, applicants should include measures of the key mediators between the intervention and the target student outcomes.

(vi) Fidelity of implementation of the intervention.

The applicant should specify how the implementation of the intervention would be documented and measured. Investigators should make clear how the fidelity measures capture the critical features of the intervention. In strong applications, investigators will propose methods that permit the identification and assessment of factors associated with the fidelity of implementation.

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 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

[26] For more information, see Donner, A., and 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 and University of Michigan, http://sitemaker.umich.edu/group-based/optimal_design_software.

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, the Institute expects researchers to 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.

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. 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 Goal Three 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. Involvement of the developer or distributor must not jeopardize the objectivity of the evaluation.

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. 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.

f. Awards

Typical awards for projects at this level will be $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. The size of the award depends on the scope of the project.

E. Requirements For Goal Four (Scale-Up Evaluations)

Because the requirements for Goal Four 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 Goal Four (Scale-up Evaluations)

Through all of its research programs that include the Scale-up Evaluations goal (Goal Four), 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., 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 (Goal Four) and Efficacy/Replication evaluations (Goal Three), 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 "at a distance" from the researcher/developer of the intervention. 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 Goal Three studies, for Goal Four 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 Goal Four awards, applicants must propose to evaluate a fully developed intervention that has strong evidence of efficacy when implemented on a limited scale.[27] By (a) clearly describing the intervention, (b) providing strong evidence of the educationally meaningful effects that are expected, (c) describing the intervention's theory of change, (d) addressing the feasibility of implementation of the intervention, and (e) detailing the conditions under which the intervention will be implemented, Goal Four 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

[27] Applicants proposing to evaluate a widely used intervention for which there is little evidence of the efficacy of the intervention should refer to Goal 3 (Efficacy and Replication). The Institute encourages applicants to discuss the appropriate goal for a proposal with the cognizant program officer listed in Section 33.

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). 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) Feasible and affordable implementation.

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 implementation of the intervention is feasible for schools and other education entities under normal conditions (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). For example, applicants might include results from prior efficacy trials indicating the degree of support provided for the implementation of the intervention and the level of fidelity attained across classrooms or schools. In strong applications, researchers will include information indicating the affordability of the intervention for schools and other education entities.

(v) 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. 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 Goal Four, 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.

c. Methodological requirements

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

For Goal Four projects, all of the methodological requirements listed under Goal Three apply to Goal Four projects. However, Goal Four does *not* allow scale-up studies based solely on secondary data analyses.

In addition to the Goal Three methodological requirements, for Goal Four projects, strong applications 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.[28]

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 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 applications, the role of Principal Investigator is assigned to someone other than individuals involved in the development or distribution of the intervention.

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

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. 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.

f. Awards
The scope of Goal Four 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.

Typical awards for projects at this level will be $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. The size of the award depends on the scope of the project.

F. Requirements For Goal Five (Measurement Projects)

The Institute's requirements for Goal Five projects are the same for all standing education research programs and are described in this section, with one exception. Requirements for proposals to develop cost-accounting tools under Goal 5 of the Education Policy, Finance, and Systems research program are detailed in the specific requirements section for that topic (Part II.10.C.c).

a. Purpose of Goal Five (Measurement)
Applications appropriate for consideration under Goal Five 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, particularly Goals Two and Three (e.g., development of fidelity instruments or development of an outcome measure that is aligned with the intervention). Goal Five applications are for research that focuses primarily on assessment development and validation.

Applicants should also be aware that under Goal Five 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 Goal 3 (Efficacy/Replication) or Goal 4 (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 Goal Five, the Institute supports research on assessments intended for use in education delivery settings for purposes such as, screening, diagnosis, progress monitoring, outcome assessment, assessment of teachers and other education professionals, and assessment of education systems.

b. Significance of the project
By describing (a) the theoretical rationale for the proposed assessment, (b) empirical evidence to support the proposed assessment, (c) the practical utility of the assessment, and (d) the components of the assessment, applicants are addressing aspects of the significance of their proposal.

(i) Rationale.

Applicants should provide a compelling rationale to support the development, refinement, and/or validation of the proposed assessment. Applicants should clearly describe the theoretical basis for the constructs that are intended to be measured by the assessment and provide examples of items that are intended to operationalize each construct. 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 these assessments, 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 could be utilized within education delivery settings for reviewers to judge the practicality of the proposed assessment for instructional purposes. 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.

c. Methodological requirements
For all applications, including those submitted under Goal Five, 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 of the *validity and reliability* of the instrument. 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.

(i) Assessment development.

Applicants should detail the proposed procedures for developing the assessment. Strong applications will include descriptions of (a) the procedures for determining the constructs that will be "tapped" 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; and (c) the process for determining the administrative procedures for conducting the assessment (e.g., mode of administration, inclusion/exclusion of individual test takers, and whether make-ups or alternative administrative conditions will be allowed). Applicants should describe the process they will use to collect empirical data that will provide feedback for

refining specific components of the assessment. *Applicants should describe the iterative development process to be used in the design and refinement of the proposed measurement tool.*

(ii) Assessment evaluation.

Applicants must clearly describe the research plans for determining the validity and reliability of the instrument. 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 should describe detailed planned analytic methods (e.g., statistical and/or psychometric models), plans for treatment of missing responses, and criteria for interpreting results.

Applicants proposing to use existing datasets (e.g., state or local student achievement databases) to validate an assessment 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.

Applicants proposing to collect original data should carefully describe the sample, measures (including reliability and validity), 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 validate the assessments against student outcomes.

d. Personnel

Competitive applicants will have research teams that collectively demonstrate expertise in (a) content area, (b) assessment, (c) implementation of, and analysis of results from, the research design that will be employed, and (d) 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 (Goal Five) 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 instrument that was the focus of a previous measurement project. 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 Goal Five grants is to develop and validate new instruments, to modify and validate existing instruments, or to validate existing instruments. Applicants

who are interested in testing whether or not using an assessment improves student outcomes must apply under Goal 3 (Efficacy/Replication) or Goal 4 (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.

g. Awards

Typical awards under Goal Five 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

18. 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 award length for each goal ranges from two to five years. Please see details for each goal in Part III Requirements of the Proposed Research section of the announcement.

19. 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 section 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.

20. 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.

21. SPECIAL REQUIREMENTS

Research supported through this program must be relevant to U.S. schools.

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, DC, 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 evaluation.

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.

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.

22. 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 center 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 center. The role of this person is primarily for communication purposes on the scientific and related budgetary aspects of the center and should be listed as the Principal Investigator. All other principal investigators should be listed as Co-Principal Investigators.

23. 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 form must be submitted electronically using the instructions provided at: https://ies.constellagroup.com. 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 form 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).

24. 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.

25. 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 SF424 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/ beginning on the following date:

June Application Package Available on	April 27, 2009
October Application Package Available on	August 3, 2009

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**
October Application Package:	**CFDA 84.305A-October 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.

26. SUBMISSION PROCESS AND DEADLINE
Applications must be submitted **electronically by 4:30 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.

27. 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) bibliography and references cited, (d) Appendix A, and (e) Appendix B. 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, bibliography, Appendix A, and Appendix B 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 .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., Teacher Quality – Read/Write, Goal 2);
(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 groups, 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; and
(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 SF424 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.

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, 5th Ed.* (American Psychological Association, 2001).

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. 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 IV.27.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.

F. 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 27.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. 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, 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.

G. 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

The appendix is limited to 10 pages. The Appendix B must adhere to the margin, format, and font size requirements described in section 27.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, test items, or other materials used in the intervention or assessment. 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 related to the intervention (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) must be included in the 25-page research narrative.

28. APPLICATION PROCESSING

Applications must be received by **4:30 pm, 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.

29. 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.

30. 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?

31. RECEIPT AND START DATE SCHEDULE

A. Letter of Intent Receipt Dates:

Summer Application Letter of Intent	April 27, 2009
Fall Application Letter of Intent	August 3, 2009

B. Application Deadline Dates:

Summer Application Deadline Date	June 25, 2009
Fall Application Deadline Date	October 1, 2009

C. Earliest Anticipated Start Date:

For Summer Application	March 1, 2010
For Fall Application	July 1, 2010

32. 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

33. INQUIRIES MAY BE SENT TO:

A. Reading and Writing

Dr. Emily Doolittle
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Emily.Doolittle@ed.gov
Telephone: (202) 219-1201

B. Mathematics and Science Education

Dr. Christina Chhin
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Christina.Chhin@ed.gov
Telephone: (202) 219-2280

C. Cognition and Student Learning

Dr. Carol O'Donnell
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Carol.ODonnell@ed.gov
Telephone: (202) 208-3749

D. Teacher Quality (Reading and Writing and Mathematics and Science Education)

Dr. Harold Himmelfarb
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Harold.Himmelfarb@ed.gov
Telephone: (202) 219-2031

E. Social and Behavioral Context for Academic Learning

Dr. Emily Doolittle
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Emily.Doolittle@ed.gov
Telephone: (202) 219-1201

F. Education Leadership

Dr. Katina Stapleton
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Katina.Stapleton@ed.gov
Telephone: (202) 219-2154

G. Education Policy, Finance, and Systems

Dr. David Sweet
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: David.Sweet@ed.gov
Telephone: (202) 219-1748

H. Early Childhood Programs and Policies

Dr. Caroline Ebanks
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Caroline.Ebanks@ed.gov
Telephone: (202) 219-1410

I. Middle and High School Reform

Dr. David Sweet
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: David.Sweet@ed.gov
Telephone: (202) 219-1748

J. Interventions for Struggling Adolescent and Adult Readers and Writers

Dr. Elizabeth Albro
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Elizabeth.Albro@ed.gov
Telephone: (202) 219-2148

K. English Language Learners

Dr. Caroline Ebanks
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Caroline.Ebanks@ed.gov
Telephone: (202) 219-1410

L. Postsecondary Education

Dr. Ram Singh
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Ram.Singh@ed.gov
Telephone: (202) 219-2025

M. Education Technology

Dr. Jonathan Levy
Institute of Education Sciences
555 New Jersey Avenue, NW
Washington, DC 20208

Email: Jonathan.Levy@ed.gov
Telephone: (202) 219-2096

34. 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.

35. 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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