

EDUCATION RESEARCH AND DEVELOPMENT CENTER GRANTS

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PART I. GENERAL OVERVIEW

1. REQUEST FOR APPLICATIONS

The Institute of Education Sciences (Institute) invites applications that will contribute to its Education Research and Development Center program.

In this announcement, the Institute of Education Sciences (Institute) describes the Education Research and Development Center grant program that is funded through the National Center for Education Research. Separate announcements are available on the Institute's website that pertain to the predoctoral and postdoctoral research training programs and education research programs funded through the 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/ncser>).

For the FY 2008 competition, the Institute will consider only applications that meet the requirements outlined below under [Part II Education Research & Development Center Grant Topics](#) and [Part III Requirements of the Proposed Research](#).

2. OVERVIEW OF THE INSTITUTE'S RESEARCH PROGRAMS

The Institute's over-arching priority is research that contributes to improved academic achievement for all students, and particularly for those whose education prospects are hindered by inadequate education services and conditions associated with poverty, race/ethnicity, limited English proficiency, disability, and family circumstance.

With academic achievement as the major priority, the Institute focuses on outcomes that differ by periods of education. In the infancy and preschool period, the outcomes of interest are those that enhance readiness for schooling, for example, language skills, and for infants and toddlers with disabilities, developmental outcomes. In kindergarten through 12th grade, the core academic outcomes of reading and writing (including reading and writing in the disciplines), mathematics and science are emphasized, as well as the behaviors and social skills that support learning in school and successful transitions to employment, independent living, and post-secondary education. At the post-secondary level, the focus is on enrollment in and completion of programs that prepare students for successful careers and lives. The same outcomes are emphasized for students with disabilities across each of these periods, and include the functional outcomes that improve educational and transitional results. The acquisition of basic skills by adults with low levels of education is also a priority.

In conducting research on academic outcomes, the Institute concentrates on conditions within the control of the education system, with the aim of identifying, developing, and validating effective education programs, practices, policies, and approaches as well as understanding the factors that influence variation in their effectiveness such as implementation. Conditions that are of highest priority to the Institute are in the areas of curriculum, instruction, assessment (including the identification of students with disabilities), the quality of the education workforce, and the systems and policies that affect these conditions and their interrelationships (for example,

accountability systems, delivery mechanisms including technology, and policies that support the ability of parents to improve educational results for their children through such means as choice of education services and provision of school-related learning opportunities in the home).

In this section, the Institute describes the overall framework for its research grant programs. Specific information on the center topics described in this announcement may be found in the sections pertaining to each center topic:

- [Cognition and Science Instruction](#)
- [Instructional Technology](#)

The Institute addresses the educational needs of typically developing students through its Education Research programs and the needs of students with disabilities through its Special Education Research programs. Both the Education Research and the Special Education Research programs are organized by [outcomes](#) (e.g., reading, mathematics), [type of education condition](#) (e.g., curriculum and instruction; teacher quality; administration, systems, and policy), [grade level](#), and [research goals](#).

A. Outcomes

The Institute's research programs focus on improvement of the following education outcomes: (a) readiness for schooling (pre-reading, pre-writing, early mathematics and science knowledge and skills, and social development); (b) academic outcomes in reading, writing, mathematics, and science; (c) student behavior and social interactions within schools that affect the learning of academic content; (d) skills that support independent living for students with significant disabilities; and (e) educational attainment (high school graduation, enrollment in and completion of post-secondary education).

B. Conditions

In general, each of the Institute's research programs focuses on a particular type of condition (e.g., curriculum and instruction) that may affect one or more of the outcomes listed previously (e.g., reading). The Institute's research programs are listed below according to the primary condition that is the focus of the program.

a. *Curriculum and instruction.* Several of the Institute's programs focus on the development and evaluation of curricula and instructional approaches. These programs include: (a) Reading and Writing; (b) Mathematics and Science Education; (c) Cognition and Student Learning; (d) Social and Behavioral Context for Academic Learning; (e) Early Childhood Programs and Policies; (f) Interventions for Struggling Adolescent and Adult Readers and Writers; and (g) Education Technology.

b. *Quality of the Education Workforce.* A second condition that affects student learning and achievement is the quality of teachers and education leaders (e.g., principals, superintendents). The Institute funds research on how to improve teacher quality through its programs on (a) Teacher Quality – Reading and Writing; (b) Teacher Quality – Mathematics and Science Education; and (c) Research on Education Leadership.

c. Administration, systems, and policy. A third approach to improving student outcomes is to identify systemic changes in the ways in which schools and districts are led, organized, managed, and operated that may be directly or indirectly linked to student outcomes. The Institute takes this approach in its programs on (a) Education Policy, Finance, and Systems; (b) Early Childhood Programs and Policies; (c) High School Reform; and (d) Postsecondary Education.

Applicants should be aware that some of the Institute's programs cover multiple conditions. For example, the following programs cover multiple conditions: (a) Cognition and Student Learning; (b) Early Childhood Programs and Policies; (c) High School Reform; (d) Education Technology; and (e) Postsecondary Education.

C. Grade Levels

The Institute's research programs also specify the ages or grade levels covered in the research program. The specific grades vary across research programs and within each research program, and grades may vary across the research goals. In general, the Institute supports research for (a) pre-kindergarten and kindergarten, (b) elementary school, (c) middle school, (d) high school, (e) post-secondary education, (f) vocational education, and (g) adult education. In addition, the Institute supports research on infants with disabilities.

D. Research Goals

The Institute has established five research goals for its research programs. Within each research program one or more of the goals may apply: (a) Goal One – identify existing programs, practices, and policies that may have an impact on student outcomes and the factors that may mediate or moderate the effects of these programs, practices, and policies; (b) Goal Two – develop programs, practices, and policies that are theoretically and empirically based; (c) Goal Three – establish the efficacy of fully developed programs, practices, and policies; (d) Goal Four – provide evidence on the effectiveness of programs, practices, and policies implemented at scale; and (e) Goal Five – develop or validate data and measurement systems and tools.

For a list of the Institute's FY 2008 research and training grant topics – including grant competitions through the Institute's National Center for Education Research and National Center for Special Education Research, please see Table 1 below. Funding announcements for these competitions may be downloaded from the Institute's website at <http://ies.ed.gov>.

Table 1: FY 2008 Research and Training Grant Topics

National Center for Education Research

1. Research Grant Topics
 - 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
 - High School Reform
 - Interventions for Struggling Adolescent and Adult Readers and Writers
 - Postsecondary Education
 - Education Technology
2. Research Training Grant Topics
 - Postdoctoral Research Training Program
 - Predoctoral Research Training Program
3. National Research and Development Center Topics
 - Cognition and Science Instruction
 - Instructional Technology

National Center for Special Education Research

1. Research Grant Topics
 - Early Intervention, Early Childhood Special Education, and Assessment for Young Children with Disabilities Research
 - Mathematics and Science Special Education Research
 - Reading, Writing, and Language Development Special Education Research
 - Serious Behavior Disorders Special Education Research
 - Individualized Education Programs and Individualized Family Service Plans Research
 - Secondary and Transition Services Research
 - Autism Spectrum Disorders Research
 - Response to Intervention Research
 - Related Services Special Education Research
2. Research Training Grant Topics
 - Postdoctoral Special Education Research Training
3. National Research and Development Center Topics
 - Center on Serious Behavior Disorders at the Secondary Level
 - Center on Response to Intervention in Early Childhood Special Education

3. PURPOSE AND BACKGROUND OF THE RESEARCH & DEVELOPMENT CENTER PROGRAM

A. Purpose of the Education Research & Development Center Program

Under the Education Sciences Reform Act of 2002, the Institute supports national research and development centers (centers) and intends for these centers to contribute significantly to the solution of education problems in the United States by engaging in research, development, evaluation, and dissemination activities aimed at improving the education system, and ultimately, student achievement. Each of the centers conducts a focused program of education research in its topic area. In addition, each center works cooperatively with the Institute to conduct supplemental research within its broad topic area, disseminate rigorous evidence and information to educators and policy-makers, and provide national leadership in advancing evidence-based practice and policy within its topic area. For information on existing Institute Centers, please see <http://ies.ed.gov/ncer/projects/randdcenters/index.asp>.

For the 2008 Education Research Center competition, the Institute invites applications for two National Education Research and Development Centers: (1) [National Research and Development Center on Cognition and Science Instruction](#); and (2) [National Research and Development Center on Instructional Technology](#). The Institute anticipates funding only one center under each topic. However, because the Institute is committed to funding only high quality work, the Institute will make an award for a particular center only if at least one application for that center is deemed meritorious under peer review and meets the requirements of the Request for Applications. In addition, applicants should note that the Institute will use a *cooperative agreement* mechanism that allows substantial Institute involvement in the activities undertaken with Federal financial support. The Institute intends to work cooperatively with grantees on the research projects, dissemination activities, and leadership activities as described below. The specific responsibilities of the Federal staff and project staff will be identified and agreed upon prior to the award.

B. Background for the Education Research & Development Center Program

The mission of the Institute includes sponsoring research that contributes to improved academic achievement for all students, and particularly for those whose education prospects are hindered by inadequate education services, and conditions associated with poverty, race/ethnicity, limited English proficiency, disability, and family circumstance. The mission of the Institute also includes disseminating information on the results of education research that are accessible and used by policymakers, educators, and the general public when making education decisions. One of the ways in which the Institute fulfills its mission is through its National Education Research and Development Centers.

The Institute's Research and Development Center program is different from the Institute's topical grant programs in the following ways: (1) Topical research grants, such as those in Teacher Quality or Mathematics and Science Education (for information on these and other programs, see <http://ies.ed.gov/ncer/projects/>), are to carry out a single program of research; whereas centers carry out a focused program of research as well as a variety of smaller scale supplemental projects that address unmet research needs within the Center's broad topic area. (2) Topical research grants do not involve significant responsibility for disseminating findings to

practitioners and for providing national leadership in the research field; in contrast, these tasks are central to centers. (3) Topical research grants typically have shorter durations, involve lower levels of funding, and do not address issues with strategies and approaches that have as much scale and breadth as is the case for centers.

For its 2008 Center competition, the Institute is interested in applications that offer the greatest promise in: (1) contributing to the solution of a specific education problem within the center topics described below; (2) providing relatively rapid research and scholarship on supplemental questions that emerge within the center's topic area and that are not being addressed adequately elsewhere; (3) providing outreach and dissemination of findings of the center, of the What Works Clearinghouse, and of other rigorous research studies and research syntheses on the center's topic to practitioners, policy makers, and technical assistance providers (e.g., comprehensive centers); and (4) providing national leadership within the center's topic by developing position papers, hosting meetings, and engaging in dialogue with researchers and practitioners in order to identify promising areas of research, development, and dissemination for the field and to advance evidence-based policy and practice

PART II. EDUCATION RESEARCH & DEVELOPMENT CENTER GRANT TOPICS

For FY 2008, the Institute's National Center for Education Research is accepting applications for Research and Development Center grants under two topics. The application deadline for each of these two topics is November 1, 2007. In this section, the Institute describes the two Research and Development Center grant topics.

Across its research programs, the National Center for Education Research is particularly interested in improving the achievement of 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.

4. TOPIC ONE: NATIONAL RESEARCH & DEVELOPMENT CENTER ON COGNITION AND SCIENCE INSTRUCTION

A. Background for the Center on Cognition and Science Instruction

U.S. scientists have provided the world with great discoveries, new knowledge, and inventions that have changed the way people live. For example, American molecular biologist James D. Watson is credited with the co-discovery of the structure of DNA and shared the Nobel Prize for Physiology or Medicine with Francis Crick and Maurice Wilkins. Linus Pauling, an American biochemist and quantum chemist, received the Nobel Prize in Chemistry for his work on the nature of chemical bonds and is one of only four people to achieve two Nobel Prizes. John Bardeen, an American physicist and engineer, is recognized for his work on the transistor and the theory of superconductivity and also received two Nobel Prizes. A team of U.S. scientists including Lawrence Roberts, Leonard Kleinrock, Robert Kahn, and Vinton Cerf is credited with the creation of the Internet. In addition to years of intense research by the individual scientists or teams of researchers, these scientific achievements are the products of the many years of education and training these scientists received. It is unlikely that the United States can continue to produce leading scientists and engineers without providing a strong science education to our children and adolescents.

Current levels of science achievement at the elementary, middle school, and secondary levels suggest that the United States is neither preparing the general population with levels of science knowledge necessary for the 21st century workplace, nor producing an adequate pipeline of future scientists. In the 2005 National Assessment of Educational Progress (NAEP), only two percent of U.S. students attained advanced levels of science achievement by Grade 12. Moreover, many U.S. students are not attaining mastery of rudimentary science knowledge and skills. In the 2005 NAEP, 32 percent of Grade 4 students, 41 percent of Grade 8 students, and 46 percent of Grade 12 students scored below the "basic" level in science. At Grade 4, 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 Grade 12, students performing below the basic level are likely to miss problems such as graphing the populations of two species. In addition, low levels of achievement are more likely among minority groups and students from low-income backgrounds.

A number of national panels have called for the improvement of science education in our country (e.g., National Research Council, 2006; Business-Higher Education Forum, 2005). The Institute of Education Sciences recognizes that the development of high quality science education curricula, the evaluation of curricula to identify those that improve student learning relative to existing curricula, and the identification of the conditions under which curricula improve student learning (including determining the student populations for which specific curricula are effective) require a substantial investment in science education research and time for the research to bear fruit. Through its research programs in Mathematics and Science Education and Cognition and Student Learning, the Institute supports research on the development and evaluation of science education curricula, instructional approaches for teaching science, and science assessments. Through its Teacher Quality – Math and Science Education research program, the Institute supports research on the development and evaluation of teacher professional development programs in science education. Through its Education Policy, Finance, and Systems research program, the Institute invests in research on the policies and systemic reform that may lead to overall improvement in education.

To complement its existing research programs that address science education, the Institute is establishing a National Research and Development Center on Cognition and Science Instruction. According to the National Research Council, "much of the current science education curriculum is based on dated assumptions about the nature of cognitive development and learning, assumptions that lead to the suboptimal teaching of science" (Committee on Science Learning, Kindergarten Through Eighth Grade, 2006, p. 336). The Institute intends for the Center on Cognition and Science Instruction to improve student learning in science by proposing specific theoretically driven modifications to existing middle school science curricula (one or more curriculum) and by conducting a systematic series of studies to test and refine such strategies for improving the design of curricula. The objective of such work would be to improve current curricula and identify general principles for the design of curriculum that could be easily applied to other science curricula.

The work of the Center builds on the research that has been conducted through the Institute's Cognition and Student Learning program. However, the Center's focused program of research differs from the work of typical research projects funded under the Institute's Cognition and Student Learning program in three distinct ways.

- First, for the Center's focused program of research the independent variables (i.e., specific theoretically derived principles for revising curricula) must be applied to science curricula that are currently in use in schools serving middle school students. In contrast, in the Cognition and Student Learning program, researchers typically test strategies for improving learning on researcher-developed content or on course materials used in college classes.
- Second, for the Center's focused program of research, the dependent variables must include standardized tests or other assessments and outcomes that are not closely tied to the specifics of a particular lesson. In contrast, in the Cognition and Student Learning program, researchers often use dependent variables that include researcher-developed items that move from those that are directly aligned with the specific content presented in

the lesson to items that represent transfer of skills to new content, but generally do not include standardized assessments.

- Finally, the Institute expects the testing of specific principles for revising curricula to be applied to broader units of material than is typically found in Cognition and Student Learning projects. Researchers supported through the Cognition and Student Learning program generally test principles on learning relatively small amounts of information. For the Center's focused program of research, the Institute expects researchers to revise educationally meaningful units of information (e.g., textbook chapters or curriculum units).

B. Specific Requirements for the Center on Cognition and Science Instruction

a. *Significance of the focused program of research.* By addressing the requirements for the science curriculum and the theoretical and empirical rationale for the proposed revisions to the science curriculum, applicants are providing the rationale for the *significance of the focused program of research*.

- (i) *Requirements for the science curriculum.* Applicants must propose to redesign or make revisions to existing science curricula for middle school or high school students. That is, for the Center on Cognition and Science Instruction, the Institute is *not* accepting applications to develop new science curricula. Applicants must begin with an existing science curriculum or curricula.

Applicants must provide a compelling rationale for the choice of the curriculum or curricula to be used in this project. The rationale should include evidence that the content of the proposed science curriculum meets recognized standards regarding the *content of the science*.

To the extent that the research plans depend on collaboration with one or more publishers, applicants should describe the details of their agreements with the publishers and ensure that collaboration with curriculum publishers does not jeopardize the objectivity of the research. For additional instructions, please [see Section 11 SPECIAL REQUIREMENTS](#) and [Section 14B.g Personnel](#).

- (ii) *Rationale for revisions to the chosen science curriculum.* Applicants should describe the theoretical and empirical rationale underlying the proposed revisions they would make to the design of the chosen science curriculum or curricula.

b. *Methodological requirements for the focused program of research.* For the Center on Cognition and Science Instruction, the Institute anticipates that applicants will propose to conduct a series of studies to test the effects of applying specific strategies for revising curriculum material on student learning or proposals to conduct several parallel studies with related independent variables. The Institute recognizes that detailing all of the studies in the series may not be possible when later experiments depend on the results of earlier experiments in the series. However, applicants must provide sufficient detail for reviewers to judge the quality

of the proposed program of research. Applicants may, for example, describe the overall approach to the focused program of research and provide specific details for two or three exemplar studies.

- (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 studies, including justification for exclusion and inclusion criteria.
- (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 randomized assignment to treatment and comparison conditions are strongly preferred. When an experimental design 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 treatment and comparison conditions.¹
- (iv) *Power.* Applicants should clearly address the power of the evaluation design to detect a reasonably expected and minimally important effect. When applicants justify what constitutes a reasonably expected effect, applicants should indicate clearly (e.g., 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 treatment 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.).² Strong applications will include empirical justification for the intraclass correlation and anticipated effect size used in the power analysis.

¹ For additional information on describing procedures for randomization, see the What Works Clearinghouse document, *Evidence Standards for Reviewing Studies* (p. 6), available at http://www.whatworks.ed.gov/reviewprocess/study_standards_final.pdf.

² For more information, see Donner, A., & Klar, N. (2000). *Design and Analysis of Cluster Randomization Trials in Health Research*. New York: Oxford University Press; Murray, D. M. (1998). *Design and Analysis of Group-Randomized Trials*. New York: Oxford University Press; W.T. Grant Foundation & University of Michigan, http://sitemaker.umich.edu/group-based/optimal_design_software.

- (v) *Measures.* Measures of student outcomes should include relevant standardized measures of student achievement in addition to other measures of student learning and achievement that are more closely aligned with the proposed intervention (e.g., end-of-unit tests, end-of-chapter tests). The applicant should provide information on the reliability, validity, and appropriateness of proposed measures.
- (vi) *Fidelity of implementation of the intervention.* The applicant should specify how the implementation of the intervention would be documented and measured. In strong applications, investigators will make clear how the fidelity measures capture the critical features of the intervention. Investigators should propose research designs that permit the identification and assessment of factors impacting the fidelity of implementation.
- (vii) *Comparison group.* Comparisons of treatments 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).

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.* Observational, survey, or qualitative methodologies are encouraged as a complement to experimental methodologies to assist in the identification of factors that may explain the effectiveness or ineffectiveness 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 as well (e.g., student time-on-task, teacher experience/time in position).
- (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, 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 using computer programs designed for such purposes. 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.

5. TOPIC TWO: NATIONAL RESEARCH & DEVELOPMENT CENTER ON INSTRUCTIONAL TECHNOLOGY

A. Background for the Center on Instructional Technology

Although many students in our country are becoming proficient in academic knowledge and skills, we continue to have students who struggle to learn in reading, writing, mathematics, and science. On the 2005 National Assessment of Educational Progress (NAEP), 35 percent of Grade 12 students performed at or above the proficient level, whereas 27 percent of Grade 12 students were unable to read at the basic level. That is, when reading grade appropriate text, these students could not extract the general meaning or make obvious connections between the text and their own experiences, or make simple inferences from the text. On the 2002 NAEP writing assessment, 24 percent of Grade 12 students performed at or above the proficient level, whereas 26 percent of Grade 12 students could not write at the basic level. On the 2005 NAEP mathematics assessment, 23 percent of Grade 12 students performed at or above the proficient level, whereas 39 percent of Grade 12 students scored below the basic level in mathematics. 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, we find a similar problem; on the 2005 NAEP, only 18 percent of Grade 12 students performed at or above the proficient level, whereas 46 percent of Grade 12 students scored below the basic level in science. At Grade 12, students performing below the basic level are likely to miss problems such as graphing the populations of two species.

The Institute of Education Sciences recognizes that the development of high quality education programs and practices, the evaluation of programs and practices to identify those that improve student learning relative to existing programs and practices, and the identification of the conditions under which programs and practices improve student learning (including determining the student populations for which specific programs and practices are effective) require a substantial investment in education research and time for the research to bear fruit. Through its education research programs, the Institute supports research on the development and evaluation of education programs, practices, assessments, and policies intended to improve student learning in reading, writing, mathematics, and science. These research activities include the development and evaluation of education technology tools. For example, through its research programs in Reading and Writing, Mathematics and Science Education, Cognition and Student Learning, and Education Technology, the Institute supports research on the development and evaluation of education technology tools for instruction and/or assessment in reading, writing, mathematics, and science. Through its Teacher Quality – Math and Science Education and Teacher Quality – Reading and Writing research programs, the Institute supports research on the development and evaluation of technology to support teacher professional development in reading, writing, mathematics, and science.

To complement its existing research programs that support the development and evaluation of education technology, the Institute is establishing a National Research and Development Center

on Instructional Technology. Electronic media and the interconnectivity that it affords are changing the way we communicate with each other, gain access to news and information, and recreate. In the 2004 Pew Internet and American Life Project Teens and Parents Survey, 81 percent of adolescents reported playing online games; 76 percent reported that they learn about current events through the internet; 89 percent use email; and 75 percent use instant messaging (Lenhart, Madden, & Hitlin, 2005). Despite considerable research on use of technology by children and adolescents and the development of technology for young people, the Institute recognizes that development of instructional technology that will improve student learning is not an easy task. In a recent evaluation of education technology reading and mathematics products, researchers did not find technology products to improve student learning in reading or mathematics (Dynarski et al., 2007). Nonetheless, a number of researchers (e.g., Federation of American Scientists, 2006; Huffaker & Calvert, 2003; Wideman et al., 2007) have argued that we have not yet exploited the full potential of electronic media for educational purposes. In particular, there have been relatively few attempts to use advanced, high-resolution multimedia gaming environments as contexts for the instruction of academic skills. In general, existing education technology are not products that students would naturally gravitate to outside of school; typically they lack high quality graphics and sounds, sophisticated user interfaces, a reward structure that cultivates a strong sense of motivation in users, and engaging activities that maintain the user's attention.

For the Center on Instructional Technology, the Institute desires proposals to develop and evaluate technology that utilizes rich multimedia environments, such as those used in multimedia games, as a context for learning academic content.

The Institute intends for the Center on Instructional Technology to improve core academic skills in reading, writing, mathematics, or science. That is, for its focused program of research, the Center must engage in the development and evaluation of instructional technology designed to provide instruction on fundamental reading, writing, mathematics, or science skills and intended to replace or be used in conjunction with curriculum for students in any middle school or high school. In particular, the Institute expects the focused program of research of the Center to differ from typical education technology projects that the Institute currently funds through its regular education research grant programs in the following ways.

- First, when developing the content to be delivered through the instructional technology product, researchers must be cognizant of existing state standards relevant to the academic domain (e.g., reading, mathematics) and grade-level which the product is intended to address.
- Second, the instructional technology must be designed to deliver educationally meaningful amounts of information, such as that which might be covered at the level of textbook chapters or curriculum units.
- Third, for the Center's focused program of research, the dependent variables must include standardized tests or other assessments and outcomes that represent learning educationally meaningful amounts of information (e.g., chapter tests, end-of-semester tests).

Finally, in addition to developing an instructional technology product or products, the Institute expects the Center to evaluate the efficacy of its product for improving student outcomes in one or more studies over the course of the award.

B. Specific Requirements for the Center on Instructional Technology

a. *Significance of the focused program of research.* By addressing the specific requirements for the instructional technology product or products that are described in this section, applicants are providing the rationale for the *significance of the focused program of research*.

- (i) *Requirements for the instructional technology product or products.* Applicants must propose to develop instructional technology products that are designed to teach academic content and skills in reading, writing, mathematics, or science. The proposed products must be designed for use in regular education delivery settings (e.g., schools, distance learning contexts) and are expected to deliver educationally meaningful amounts of information.
- (ii) *Description of the proposed instructional technology product or products.* Applicants must provide a sufficiently detailed description of the applicant's concept for the proposed technology product or products so that reviewers are able to judge whether the proposed technology meets the Institute's request for the development of sophisticated instructional technology products that will improve student learning in reading, writing, mathematics or science.
- (iii) *Educational rationale for the proposed product or products.* Applicants must provide a compelling rationale for the proposed product or products. To address the *practical* importance of the product, applicants should describe, for example, how the content to be covered in the product relates to state standards relevant to the content domain and grade level that the proposed product is intended to address. Applicants should address the theoretical framework and empirical research on learning that serves as the foundation for the product.
- (iv) *Rationale for the multimedia environment for the proposed product or products.* Applicants should propose to develop or modify an existing multimedia environment. Applicants should address the theoretical foundation and empirical research on electronic media that guides the development of a product that will be highly engaging, motivating, and challenging for adolescents.

As indicated, applicants may propose to modify an existing multimedia environment. Researchers may partner with a for-profit company that provides, for example, a game engine (perhaps an older version) that could serve as the foundation for the development of an instructional technology game. Including the company as a partner must not compromise the objectivity of the research.

b. *Methodological requirements for the development of the product or products.* The Institute expects the focused program of research to include a development phase and an evaluation

phase. The requirements for the development phase are detailed in this section; the requirements for the evaluation phase are detailed in the following section.

For the development phase of the focused program of research, applicants must clearly address the proposed methods for developing the product (or products) 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 product. A major objective of the development phase is to refine and improve the initial version of the product 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 intervention measures that could be used during the evaluation phase of the focused program of research.

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 simple 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 the development phase, reviewers need to understand the iterative development process to be used in the design and refinement of the proposed intervention.*

The Institute anticipates that multiple scientists may work on the development of the proposed product and that their work needs to be well-coordinated. Strong applications will clearly describe the coordination, for example, of individual studies that together produce the final product. In addition, by the end of the development phase, the Institute expects investigators to have a fully developed product and demonstrated that the product can be implemented in an authentic education delivery setting.

- (i) *Sample.* The applicant should define, as completely as possible, the samples and settings that will be used to assess the feasibility and usability of the intervention.
- (ii) *Research plan.* The applicant must provide a detailed research plan in which they detail the proposed procedures for developing the product (or products). Strong applications will include clear descriptions of: (a) what needs to be developed; (b) the procedures for developing the product; and (c) the procedures (including sample, measures, and procedures for analyzing data) for determining if the product is functioning as intended (e.g., Does the software program crash when students use it?). *Applicants should describe the iterative development process to be used in the design and refinement of the*

proposed product, and plans for acquiring evidence about the operation of the product according to the logic model that they describe.

- (iii) *Measures.* In the development phase, the Institute anticipates that researchers will typically rely on the collection of process data that can help the researchers refine the product and provide insight into the feasibility and usability of the proposed product in authentic education delivery settings. Applicants should clearly describe (a) what needs to be observed in order to determine if the product is operating as intended and (b) how those observations will be collected. Observational, survey, or qualitative methodologies are encouraged to identify conditions that hinder or support implementation of the product.

c. *Methodological requirements for the evaluation of the product or products.* For the evaluation of the product or products, applicants should propose rigorously designed efficacy trials to determine whether or not the fully-developed product is 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 effectiveness (scale-up) evaluations. The limited generalizability can arise both from the lack of a full range of types of settings and participants in the study, as well as through the intensive involvement of the developers and researchers in the implementation of the intervention. A well-designed efficacy trial provides evidence on whether an intervention **can** work, but not whether it would work if deployed widely.

The Institute anticipates that lead scientists who oversee the evaluation of the proposed product (or products) are likely to be different from the scientists who develop the proposed product. Strong applications will clearly describe the roles, responsibilities, and coordination work across scientists responsible for the development of products and scientists responsible for the evaluation.

- (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 randomized assignment to treatment and comparison conditions are strongly preferred. 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 treatment and comparison conditions.³

Only in circumstances in which a randomized trial is not possible may alternatives that substantially minimize selection bias or allow it to be modeled be employed. Applicants proposing to use a design other than a randomized design must make a compelling case that randomization is not possible. Acceptable alternatives include appropriately structured regression-discontinuity designs or other well-designed quasi-experimental designs that come close to true experiments in minimizing the effects of selection bias on estimates of effect size. A well-designed quasi-experiment is one that reduces substantially the potential influence of selection bias on membership in the intervention or comparison group. This involves demonstrating equivalence 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), or obtaining such equivalence through statistical procedures such as propensity score balancing or regression. It also involves demonstrating equivalence or removing statistically the effects of other variables on which the groups may differ and that may affect intended outcomes of the program being evaluated (e.g., demographic variables, experience and level of training of teachers, motivation of students). Finally, it involves a design for the initial selection of the intervention and comparison groups that minimizes selection bias or allows it to be modeled. For example, a very weak quasi-experimental design that would *not* be acceptable as evidence of program efficacy would populate the intervention condition with teachers who volunteered for the program to be evaluated, and would select comparison teachers who had the opportunity to volunteer but did not. In contrast, an acceptable design would select teachers in one particular geographical area of a city to be in the intervention, whereas teachers in another geographical area, known to be demographically similar, would be selected to be in the comparison condition. In the former case, self-selection into the intervention is very likely to reflect motivation and other factors that will affect outcomes of interest and that will be impossible to equate across the two groups. In the latter case, the geographical differences between the participants in the two groups would ideally be unrelated to outcomes of interest, and in any case, could be measured and controlled for statistically.

- (iv) *Power.* Applicants should clearly address the power of the evaluation design to detect a reasonably expected and minimally important effect. When applicants justify what constitutes a reasonably expected effect, applicants should indicate clearly (e.g., 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 treatment 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

³ For additional information on describing procedures for randomization, see the What Works Clearinghouse document, *Evidence Standards for Reviewing Studies* (p. 6), available at http://www.whatworks.ed.gov/reviewprocess/study_standards_final.pdf.

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.).⁴ Strong applications will include empirical justification for the intraclass correlation and anticipated effect size used in the power analysis.

- (v) *Measures.* Measures of student outcomes should include relevant standardized measures of student achievement in addition to other measures of student learning and achievement that are more closely aligned with the proposed intervention (e.g., end-of-unit tests, end-of-chapter tests). The applicant should provide information on the reliability, validity, and appropriateness of proposed measures. In strong applications, investigators will make clear that the skills or content the intervention is designed to address are captured in the various measures that are proposed.
- (vi) *Fidelity of implementation of the intervention.* The applicant should specify how the implementation of the intervention would be documented and measured. In strong applications, investigators will make clear how the fidelity measures capture the critical features of the intervention. Investigators should propose research designs that permit the identification and assessment of factors impacting the fidelity of implementation.
- (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 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 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

⁴ For more information, see Donner, A., & Klar, N. (2000). *Design and Analysis of Cluster Randomization Trials in Health Research*. New York: Oxford University Press; Murray, D. M. (1998). *Design and Analysis of Group-Randomized Trials*. New York: Oxford University Press; W.T. Grant Foundation & University of Michigan, http://sitemaker.umich.edu/group-based/optimal_design_software.

using or doing in a particular area. Business-as-usual generally refers to situations in which the standard or frequent practice across the nation 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 are important to understanding the net impact of the experimental 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.

The purpose here is to obtain information useful for *post hoc* explanations of why the experimental treatment does or does not improve student learning relative to the counterfactual.

Finally, 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*. Observational, survey, or qualitative methodologies are encouraged as a complement to experimental methodologies to assist in the identification of factors that may explain the effectiveness or ineffectiveness 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). The research should demonstrate the conditions and critical variables that affect the success of a given 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, 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 using computer programs designed for such purposes. 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.

PART III. REQUIREMENTS OF THE PROPOSED RESEARCH

6. GENERAL REQUIREMENTS OF THE PROPOSED RESEARCH

A. Basic Requirements

a. *Applying to multiple topics.* Applicants may submit proposals to more than one of the Institute's FY 2008 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.

b. *Applying to a particular topic.* To submit an application to the Institute's Education Research & Development Center grant program, applicants must choose the specific topic under which they are applying. Each topic has specific requirements. The Institute strongly encourages potential applicants to contact the relevant program officer listed in [Section 20](#) if they have any questions regarding the appropriateness of a particular project for submission under a specific Center topic.

For the 2008 Education Research Center competition, applicants must submit an application *either* under Topic One ([National Research and Development Center on Cognition and Science Instruction](#)) *or* Topic Two ([National Research and Development Center on Instructional Technology](#)).

B. Requirements for Focused Program of Research

The Institute intends for the work of the Centers to include a focused program of research that ideally will result in solutions or answers to specific education problems at the end of 5 years. The Institute expects the *focused program of research* to comprise about 50 to 75 percent of a Center's activities depending on the cost and effort required to carry out the focused program of research. For the FY 2008 Center competition, the Institute expects applicants to propose a focused program of research that consists of a set of tightly linked studies that build on each other and together result in the development (or redesign) and evaluation of an education product or products as specified under the Specific Requirements sections for each Center topic ([Part II, Section 4B](#) for Center on Cognition and Science Instruction; [Part II, Section 5B](#) for Center on Instructional Technology). The Institute strongly discourages applications that propose a model in which multiple investigators each conduct separate studies that are only loosely coordinated around a given topic.

Although the Centers have much broader functions than conducting a focused program of research, the research program is the only portion of the activities of a Center that can be well-specified in advance, and thus can provide a fair basis for comparing and evaluating applications for funding. Consequently as indicated by the requirements described in this section, the majority of the application should be a detailed description of the focused program of research.

a. *Significance of the focused program of research.* Applicants must first specify the topic to which they are applying and the specific focus of the center. The rationale for the significance of the focused program of research must address specific requirements detailed in [Part II, Section 4B.a](#) for Center on Cognition and Science Instruction or in [Part II, Section 5B.a](#) for Center on Instructional Technology.

b. *Methodological requirements for the focused program of research.* The most important consideration in the competitive review of proposals will be the applicant's articulation of the focused program of research and development. Applications must include well-specified objectives, a detailed research methods and data analysis plan, a plan for coordinating the work of the cooperating scientists, a timetable for accomplishing the research, and the specific outcomes of the program of research.

The methodological requirements for applications to the Center on Cognition and Science Instruction are specified in [Part II, Section 4B.c](#).

The methodological requirements for applications to the Center on Instructional Technology are detailed in [Part II, Section 5B.b](#) and [Part II, Section 5B.c](#).

c. *Timeline.* Along with the description of the focused program of research, applicants should include a clear timeline for the activities in their focused program of research.

d. *Research team.* Competitive applicants will have leadership and staff that collectively demonstrate expertise in (a) the academic domain that is the focus of the proposed product or products (e.g., science, mathematics, reading), (b) the development of the proposed product or products (e.g., instructional technology, application of cognitive science to learning in education settings), (c) implementation and analysis of results from the research design that will be employed, (d) working with education delivery settings, and (e) experience that is relevant to dissemination and national leadership activities

e. *Collaborations with schools.* When the proposed focus program of research includes conducting research activities in schools, applicants should document that they have the capacity and experience to obtain such cooperation and to describe the steps they have taken or will take to obtain it. When the plans for the first year of grant activities include substantial work to be conducted in schools or other education delivery settings, strong applications will include documentation of the availability and cooperation of the schools or other education delivery settings that will be required to carry out that work via a letter of support from the education organization(s).

C. Requirements for Supplemental Research Projects

As part of the center activities, applicants are expected to conduct smaller research projects that speak to other issues that are important within the context of the broad topic of the center. The Institute intends to work cooperatively with center grantees to select and design supplementary studies as needed to respond to pressing policy and practice needs within the topic covered by the center. In that context, the Institute does not expect applicants to provide highly detailed research plans for these studies in the application. The applicant should, however, document capacity to conduct such studies (e.g., knowledge of the field and research experience of key personnel) and provide two examples of supplementary studies the applicant believes might be useful to undertake, including a short rationale explaining the need for the proposed study and a short description of the type of research approach that would be used. Although this section of the application does not need to be long, applicants should bear in mind that capacity for conducting quick response research projects will carry weight in the scoring of the application.

D. Requirements for Outreach and Dissemination Activities

As part of the center activities, applicants are expected to: (a) develop dissemination products that translate their research findings for multiple audiences, including policy makers, teachers and parents; (b) publish in peer reviewed journals; (c) publish or otherwise disseminate products such as measures and interventions developed during the course of the research; (d) host a web page and use other electronic media to provide continuously updated information about the Center's activities; and (e) engage in dissemination and outreach activities at professional conferences and other appropriate venues. Through the cooperative agreement, the Institute intends to work with center grantees to develop and plan these activities. In the application, the Institute does expect applicants to provide evidence that they are capable of engaging in all types of dissemination activities (e.g., knowledge of and connections with practitioner and policy communities) and to provide two examples of the types of activities they believe might be useful to undertake, including a short rationale justifying the need for the proposed activity and a description of their capacity for conducting such projects (e.g., experience translating research findings for multiple audiences). Although this section of the application does not need to be long, applicants should bear in mind that capacity for dissemination activities will carry weight in the scoring of the application.

E. Requirements for National Leadership Activities

As part of the center activities, applicants are expected to provide national leadership within the center's topic area by developing position papers, hosting meetings, and engaging in dialogue with researchers and practitioners in order to identify promising areas of research, development, and dissemination for the field. The Institute intends to work cooperatively with center grantees in the development and planning of such activities. In that context, the Institute does not expect applicants to provide highly detailed plans for the leadership activities. It is sufficient to provide information on why the proposed Center staff are qualified to fulfill this leadership role if awarded a Center, as well as two examples of the types of activities the applicant believes might be useful to undertake, including a short rationale justifying the need for the proposed activity and a description of the applicant's capacity for conducting such projects. Although this section of the application does not need to be long, applicants should bear in mind that capacity for carrying out leadership and national activities will carry weight in the scoring of the application.

F. Requirements for Management of Center Activities

The Institute anticipates that the development and evaluation of the proposed education product or products, as well as the supplementary studies, outreach and dissemination activities, and national leadership activities will require the coordination of multiple scientists and other partners. Applicants should describe plans and procedures for the overall management of the center. These plans should include details of procedures for coordinating with schools and districts or other education delivery settings involved in the projects of the center.

PART IV. GENERAL SUBMISSION AND REVIEW INFORMATION

7. APPLICATIONS AVAILABLE

Application forms and instructions for the electronic submission of applications will be available for the programs of research listed in this Request for Applications from the following web site:

<http://www.Grants.gov>

by the following dates:

November 1, 2007 Application Deadline Date

July 31, 2007

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).

8. MECHANISM OF SUPPORT

The Institute intends to award center grants in the form of cooperative agreements for periods up to 5 years pursuant to this request for applications.

9. FUNDING AVAILABLE

Typical awards will be in the range of \$1,000,000 to \$2,000,000 (total cost = direct + indirect) per year for 5 years. The size of the award depends on the scope of the activities.

The Institute expects the *focused program of research* to comprise about 50 to 75 percent of a Center's activities depending on the cost and effort required to carry out the focused program of research, with the remainder of the budget devoted to supplementary studies, dissemination activities, leadership activities, and any administrative activities not included in the focused program of research.

Although the plans of the Institute include the education research and development center program, 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 Institute anticipates funding only one center under each goal. However, because the Institute is committed to funding only high quality work, the Institute will make an award for a particular center only if at least one application for that center is deemed meritorious under peer review.

10. 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.

11. SPECIAL REQUIREMENTS

Activities 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. The Institute asks IES-funded investigators to submit voluntarily to the Educational Resources Information Center (ERIC) an electronic version of the author's final manuscript upon acceptance for publication in a peer-reviewed journal, resulting from research supported in whole or in part, with direct costs from the Institute. The author's final manuscript is defined as the final version accepted for journal publication, and includes all modifications from the peer review process.

Applicants should budget for one meeting each year in Washington, DC, with other grantees and Institute staff. At least one project representative should attend the two-day meeting.

The Institute anticipates that a substantial portion 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. Applications from, or collaborations including, such organizations should justify the need for Federal assistance to undertake the evaluation of programs that are marketed to consumers and consider sharing the cost of the evaluation, as well as sharing all or a substantial portion of the cost of the implementation of the product being evaluated (e.g., sharing the cost of textbooks for students).

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 3 months of receipt of an award.

Through the terms of the cooperative agreement, grantees will work with the Institute to plan activities related to (a) supplementary research; (b) dissemination and outreach (including development of specific products, such as manuals, booklets, and guides); and (c) leadership in the field.

12. LETTER OF INTENT

A letter indicating an applicant's intent to submit an application is optional, but encouraged, for each application. The letter of intent form must be submitted electronically by the date listed at the beginning of this document, using the instructions provided at:

<https://ies.constellagroup.com>.

The letter of intent should include:

- Descriptive title;
- Topic that the applicant will address;
- Brief description of the proposed project;

- Name, institutional affiliation, address, telephone number and e-mail address of the principal investigator(s);
- Name and institutional affiliation of any key collaborators and contractors;
- Duration of the proposed project;
- Estimated budget request for each year; and
- Total budget request.

The project description should be single-spaced and should not exceed one page (about 3,500 characters). Although the letter of intent is optional, is not binding, and does not enter into the review of a subsequent application, the information that it contains allows Institute staff to estimate the potential workload to plan the review.

13. SUBMITTING AN APPLICATION

Applications must be submitted **electronically by 4:30 p.m., Washington, DC time** by the application deadline date, using the standard forms and the instructions provided at the following web site:

<http://www.Grants.gov>

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

14. CONTENTS OF APPLICATION

All applications and proposals for Institute funding must be contained within specified page limits. Internet Web site addresses (URLs) may not be used to provide information necessary to the review because reviewers are under no obligation to view the Internet sites.

All of the instructions and requirements regarding (a) submission of the application, (b) application page limits, (c) acceptable format, and (d) necessary attachments (.PDF files) will be provided in the **Application Instructions** document for this competition to be found under the “For Applicants -- Apply for Grants” link of Grants.gov. Also, all of the required forms will be provided in the **Application Package** that accompanies the Application Instructions.

Applicants must search for the downloadable Application Instructions and Application Package for each competition by the CFDA number. The alpha suffix should not be included in the search (e.g., search for 84.305, not 84.305C). For this competition, applicants need to download the “Education Research & Development Center” Application Instructions and Application Package.

In this section, the Institute provides instructions regarding the content of the (a) [center summary/abstract](#), (b) [center program narrative](#), (c) [bibliography and references cited](#), (d) [biographical sketches of senior/key personnel](#), (e) [narrative budget justification](#) (f) [subaward budget](#), (g) [Appendix A](#), (h) [Appendix B](#), (i) [human subjects narrative](#), and (j) [additional forms](#). The instructions below will be reiterated in the Application Instructions document for this competition, which will be available, as noted above, under the “For Applicants -- Apply for Grants” link of <http://www.Grants.gov>.

A. Center Summary/Abstract

The center summary/abstract will be submitted as a .PDF attachment, is limited to 1 single-spaced page and must adhere to the margin, format, and font size requirements described in the center narrative section.

The center summary/abstract should include (1) the title of the center; (2) the RFA topic under which the applicant is applying; (3) a brief description of the focused program of research; and (4) a list of the key personnel.

B. Center Program Narrative

The center program narrative will be submitted as a .PDF attachment. Incorporating the requirements detailed in [Part III Requirements of the Proposed Research](#) and the requirements listed under the Specific Requirements section of the relevant center topic ([Part II, Section 4B](#) Specific Requirements for the Center on Cognition and Instruction; [Part II, Section 5B](#) Specific Requirements for the Center on Instructional Technology), the *center program narrative* provides the majority of the information on which reviewers will evaluate the proposal.

The center program narrative must include the seven sections described below (a. "Significance of the Focused Program of Research" through g. "Personnel") in the order listed and must conform to the format requirements described on the application submission website.

The center program narrative is limited to **35 single-spaced pages** for all applicants. This 35-page limit does not include any of the SF 424 forms, the one-page summary/abstract, the appendices, research on human subjects information, bibliography and references cited, biographical sketches of senior/key personnel, narrative budget justification, subaward budget information or certifications and assurances. **Reviewers are able to conduct the highest quality review when applications are concise and easy to read, with pages numbered consecutively.**

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. Text must be single spaced in the narrative. 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. **It is very important that applicants review carefully the "Application Format Requirements" outlined in *Fiscal Year 2008 Application Package Highlights***, which will be part of the application instructions, available on <http://www.Grants.gov> no later than July 31, 2007.

a. *Significance of the Focused Program of Research.* To address the significance of the focused program of research, applicants should refer to the issues posed in sections detailing the specific requirements for each center topic. By addressing the requirements for the science curriculum and the theoretical and empirical rationale for revising the science curriculum as described in [Part II, Section 4B.a](#): Significance of the focused program of research for the Center on Cognition and Science Instruction, researchers are providing the rationale for the *significance of the focused program of research* for applications under this center topic. By addressing the requirements detailed under [Part II, Section 5B.a](#): Significance of the focused program of

research for the Center on Instructional Technology, researchers are providing the rationale for the *significance of the focused program of research* under this center topic.

Applicants may use [Appendix B](#) to include up to 10 pages of examples of materials to be developed or evaluated (e.g., computer screens depicting how information is presented to students, examples of test items for a proposed assessment). Applicants should be aware that all narrative text describing the theoretical background, empirical support, components of the assessment or intervention, or any other aspect of the proposal must be included within the 35-page center program narrative. The only materials that are allowed in [Appendix B](#) are examples of the materials that are used by or presented to participants in the intervention or assessment.

b. *Research Plan for the Focused Program of Research.* Applicants should address all of the requirements detailed in [Part III, Section 6B.b](#) Methodological requirements for the focused program of research.

c. *Supplemental Studies.* Applicants should address all of the requirements detailed in [Part III, Section 6C](#) Requirements for Supplemental Research Projects.

d. *Outreach and Dissemination Activities.* Applicants should address all of the requirements detailed in [Part III, Section 6D](#) Requirements for Outreach and Dissemination Activities.

e. *Leadership Activities.* Applicants should address all of the requirements detailed in [Part III, Section 6E](#) Requirements for National Leadership Activities.

f. *Management and Institutional Resources.* Applicants should address all of the requirements detailed in [Part III, Section 6F](#) Management of Center Activities. In addition, applicants should provide a description of the resources available to support the center at the applicant's institution and in the field settings in which the research will be conducted.

g. *Personnel.* Applicants must include brief descriptions of the qualifications of key personnel (information on personnel should also be provided in their curriculum vitae) in the research narrative to be compliant with the requirements of the Request for Applications. For each of the key personnel, please describe the roles, responsibilities, and percent of time devoted to the project.

C. Bibliography and References Cited

This section will be submitted as a .PDF attachment. Please include complete citations, including titles and all authors, for literature cited in the research narrative.

D. Biographical Sketches of Senior/Key Personnel

This section will be submitted as a .PDF attachment. Abbreviated curriculum vitae should be provided for the principal investigator(s) and other key personnel. *Each vita is limited to 4 pages and should include information sufficient to demonstrate that personnel possess training and expertise commensurate with their duties (e.g., publications, grants, relevant research experience), and have adequate time devoted to the project to carry out their duties. The fifth page of the attachment should list current and pending grants with the proportion of the*

individual's time allocated to each project. The curriculum vita must adhere to the margin, format, and font size requirements described in the project narrative section.

E. Narrative Budget Justification

This section will be submitted as a .PDF attachment and should provide sufficient detail to allow reviewers to judge whether reasonable costs have been attributed to the project. The budget justification should correspond to the itemized breakdown of project costs that is provided in the Research & Related Budget (SF 424) Sections A & B; C, D, & E; and F-K. It should include the time commitments and brief descriptions of the responsibilities of key personnel. For consultants, the narrative should include the number of days of anticipated consultation, the expected rate of compensation, travel, per diem, and other related costs. A justification for equipment purchase, supplies, travel and other related project costs should also be provided in the budget narrative for each project year outlined in the Research & Related Budget (SF 424).

For those applications that include a subaward(s) for work conducted at collaborating institutions, the narrative should also provide the details about the subaward(s). Include the actual subaward budgets as a separate attachment. (See below [“Subaward Budget”](#).)

Applicants should use their institution's federal indirect cost rate and use the off-campus indirect cost rate where appropriate (see instructions under [Section 11 Special Requirements](#)).

F. Subaward Budget

This section will be submitted as a .PDF attachment. For applications that include a subaward(s) for work conducted at collaborating institutions, applicants must submit an itemized budget spreadsheet for each subaward for each project year. As noted above, the details of the subaward costs should be included in the [Narrative Budget Justification](#). An Excel spreadsheet will be provided in the electronic application package to allow applicants to enter the subaward budget information in accordance with the prescribed format. Applicants will complete the spreadsheet in Excel format, convert it to a .PDF file, and then upload it as an attachment.

G. Appendix A

Appendix A should be included at the end of the [Center Program Narrative](#), and will be submitted as part of the same .PDF attachment.

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. 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. 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 appendix is limited to 15 pages. 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.

H. Appendix B (optional)

If applicable, Appendix B should be included at the end of the [Center Program Narrative](#), following [Appendix A](#), and will be submitted as part of the same .PDF attachment.

The purpose of Appendix B is to allow applicants who are proposing 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. Appendix B is limited to 10 pages. 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 35-page research narrative.

I. Research on Human Subjects

This section will be submitted as a .PDF attachment. If an applicant proposes research activities involving human subjects at any time during the proposed project period, either at the applicant organization or at any other performance site or collaborating institution, then the applicant must provide either a human subjects "exempt research narrative" or a "nonexempt research narrative" and upload this narrative as instructed in the *Fiscal Year 2008 Application Package Highlights*. See the U.S. Department of Education's web page for detailed information about the protection of human subjects in research:

<http://www.ed.gov/policy/fund/guid/humansub/overview.html>

J. Additional Forms

Please note that applicants selected for funding will be required to submit the following certifications and assurances before a grant is issued:

- (1) SF 424B-Assurances-Non-Construction Programs
- (2) Grants.gov Lobbying Form
- (3) ED 80-0014 (if applicable)-Lower Tier Certification
- (4) SF-LLL (if applicable) - Disclosure of Lobbying Activities
- (5) Protection of Human Research Subjects assurance and/or Institutional Review Board certification, as appropriate

15. APPLICATION PROCESSING

Applications must be received by **4:30 p.m. Washington, DC time** on the application deadline date listed in the heading of this request for applications. Upon receipt, each application will be reviewed for compliance 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.

16. 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 three 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 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.

17. 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 the section on [Requirements of the Proposed Research](#), in the Specific Requirements section of the relevant research grant topic, and in the description of the [Center Program Narrative](#), which appears in the section on [Contents of Application](#).

A. Significance of the Focused Program of Research

For significance of the focused program of research, applicants need to provide the theoretical, empirical, and practical rationale underlying the proposed focused program of research as detailed in the section on the specific requirements for the relevant center topic ([Part II, Section 4B](#) Specific Requirements for the Center on Cognition and Science Instruction; [Part II, Section 5B](#) Specific Requirements for the Center on Instructional Technology).

B. Research Plan for the Focused Program of Research

Does the applicant adequately address the methodological requirements described in the [Part III, Section 6B.b](#) Methodological requirements for the focused program of research?

C. Plans for Other Center Activities

Does the content of the examples of proposed supplementary studies, dissemination activities, and leadership activities and the description of the applicant's capacity to conduct such projects demonstrate that the applicant has the ideas, experience, and capability to successfully carry-out such projects in cooperation with the Institute?

D. Management and Institutional Resources

Do the plans and procedures for the overall management of the center indicate that the applicant has the capacity to efficiently and successfully complete the proposed research, dissemination, and leadership activities? 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 proposed center activities?

E. Personnel

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

18. RECEIPT AND START DATE SCHEDULE

A. Letter of Intent Receipt Dates:

November 1, 2007 Application Deadline Date September 6, 2007

B. Application Deadlines:

Fall Deadline Date November 1, 2007

C. Earliest Anticipated Start Date:

November 1, 2007 Application Deadline Date July, 2008

19. 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

20. INQUIRIES MAY BE SENT TO

A. National Research & Development Center on Cognition and Science Instruction

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

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

B. National Research & Development Center on Instructional Technology

Dr. Edward Metz
Institute of Education Sciences

555 New Jersey Avenue, NW
Washington, DC 20208

Email: Edward.Metz@ed.gov
Telephone: (202) 208-1983

21. 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.

22. 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.

23. REFERENCES

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Committee on Science Learning, Kindergarten Through Eighth Grade. (2006). *Taking Science To School: Learning and Teaching Science in Grades K-8*. R. A. Duschl, H. A. Schweingruber, & A. W. Shouse (Eds.). Board on Science Education, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academics Press.

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