Written Testimony of Felice J. Levine, PhD
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Regarding
Fiscal Year 2013 Appropriations for the National Science Foundation
U.S. House of Representatives, Committee on Appropriations, before the
Subcommittee on Commerce, Justice, Science and Related Agencies
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Chairman Wolf, Ranking Member Fattah, and Members of the Subcommittee, it is my privilege to be here today to testify about the National Science Foundation's fiscal year (FY) 2013 Budget Request. While our Association values the significant role of the National Science Foundation (NSF) as a whole in advancing science for our Nation, my testimony specifically focuses on the $875.6 million proposed by the President for the NSF's Education and Human Resources Directorate (EHR). This Directorate is responsible for achieving excellence in U.S. science, technology, engineering, and mathematics (STEM) education in order to support the development of the scientific workforce as well as a scientifically literate citizenry.

I am the Executive Director of the American Education Research Association (AERA). AERA is the major national scientific association of 25,000 scholars dedicated to advancing knowledge about education, to encouraging scholarly inquiry related to education, and to promoting the use of research to serve the public good. Founded in 1916, AERA is the most prominent national and international research society in this field. Our members are primarily university faculty and senior researchers at research institutions, who are responsible for conducting research in all areas of education and learning. Many members are engaged in STEM education research, and, because of the leadership role of EHR in this field, we have closely followed the innovative program development and strong leadership that have characterized this Directorate.

We are honored to be asked to testify this year. Our Association wishes to call the committee's attention to significant developments within the Directorate and to offer its enthusiastic support for plans to build a sustainable base of core research sufficient to support the STEM needs of the Nation. While we welcome and fully support the President's request for an increase of $46.6 million in funding for EHR for fiscal 2013, we are particularly enthusiastic about how the Directorate plans to use this money to advance sustained and significant STEM research.

Laudable Change

The EHR plan for FY 2013 sets forth important priorities and directions that show laudable ambition to advance STEM education and learning. Noteworthy is (a) the central involvement of EHR in the design and implementation of a 5-year inter-agency plan for federal STEM investment and (b) the joint effort being led by EHR and the Institute of Education Sciences (IES) in the Department of Education to establish standards of evidence for STEM education innovations and research.

Even more impressive is what is modestly described as "a new framing of the EHR investment portfolio into three categories: Core R&D, Leadership, and Expeditions." The plan recognizes that meaningful change in the scientific workforce capacity and in public literacy requires (a) sustained and cumulative investment in research, and (b) the staged development and planning for such investments.

A Sensible and Strategic R&D Plan

Core R&D investments are proposed and planned in four areas: STEM learning, STEM learning environments, broadening participation and institutional capacity in STEM, and STEM professional workforce preparation. These Core R&D areas evolved and were crafted based on national studies and reports and through wide consultation with the community. And, as importantly, in this new plan, R&D is *not isolated but integrated* across all four divisions.

As set forth in the proposed EHR budget, each of the four divisions will receive $5 million dollars, through a newly established "Core Launch Fund" to begin a program of core research necessary to provide a foundation for STEM reforms. This allocation will permit a first round of grant awards that will shape the core R&D areas in each division by synthesizing existing work, identifying future needs, and highlighting important trends and challenges. The plan is well reasoned and incremental—putting in place a process of change with feedback, reflection, and adjustments.

In FY 2013, EHR will commence a year of dialogue with key stakeholders and communities to assess the core foci. This step will be followed by a one-year period in FY 2014 of clarification and realignment of program combinations. The core R&D emphases in each division reflect staff experience and the readiness of relevant research communities to respond rapidly. Some of these programs will be collaborations with the U.S. Department of Education and will be designed to take advantage of the distinctive research capabilities that EHR has developed and the leadership role of the National Science Foundation for the advancement of science and for building cumulative knowledge in education, learning, and science education.

As set forth in the EHR budget plan, the aim is wisely to encourage ownership of an R&D investment in every division. Each EHR division will take responsibility for the intellectual definition, direction, and coherence of one core R&D area. To summarize what is set forth in the FY 2013 NSF Budget Request to Congress:

1. The Division of Research on Learning in Formal and Informal Settings (DRL) will lead the Core R&D area of STEM Learning. DRL will continue to support the development of innovative resources, models, and tools for K-12 STEM education. DRL takes the lead at NSF in building knowledge and evidence through fundamental research on STEM learning, national STEM priorities, and evaluation studies and activities. To strengthen these connections, the Math and Science Partnership (MSP) program will be based in DRL. Also, $15 million will be added to the Discovery Research K-12 (DR-K12) program in FY 2013 to

develop, validate, and scale up evidence-based approaches to improve student learning at the K-12 and undergraduate levels.

The principal goal of this initiative is to fund research that can build a body of rigorous and cumulative knowledge about the STEM learning process in all its forms—across the full range of settings and contexts of learning and the full spectrum of diverse populations, including those traditionally underrepresented in STEM. The new R&D emphasis in DRL also includes development of innovative and effective approaches and instruments for promoting and assessing learning. A priority of a program newly named "Advancing Informal STEM Learning" (AISL), for example, will be to fund R&D projects that are at the frontiers of informal learning, that can identify learning strategies generally useful for the field, and that broaden participation of underrepresented groups and incorporate collaborative strategies with other partners.

2. The Division of Undergraduate Education (DUE) will lead the Core R&D area of STEM Learning Environments. The DUE portfolio of programs will aim to build and expand a coherent body of knowledge on innovative and effective STEM learning environments at all education levels to meet the challenges of the 21st century. In FY 2013, the Widening Implementation and Demonstration of Evidence-based Reforms (WIDER) program will fund research and demonstration projects exploring how to achieve widespread sustainable implementation of evidence-based undergraduate instructional practices to improve student outcomes.

In addition, the Transforming Undergraduate Education in STEM (TUES) program will fund a number of projects responsive to the President's Council of Advisors on Science and Technology (PCAST) draft report on strengthening early undergraduate education. The budget request calls for $15 million to develop, validate, and scale up evidence-based approaches to improve student learning at the K-12 and undergraduate levels. This effort will be jointly funded by the U.S. Department of Education.

3. The Division of Human Resource Development (HRD) focuses on building a diverse and well-qualified S&E workforce. HRD will lead the Core R&D area of Broadening Participation and Institutional Capacity in STEM to build a coherent body of knowledge about successful approaches and models for expanding participation for all groups traditionally underrepresented in STEM. The Core work also includes building the institutional capacity to ensure that all students have access to the highest quality STEM programs and instruction.

4. The Division of Graduate Education (DGE) invests in U.S. graduate students and innovative graduate programs to prepare tomorrow's leaders in STEM. DGE will lead the Core R&D area of STEM Professional Workforce Development. This portfolio of research will build and advance a coherent body of knowledge about successful approaches, practices, and models for STEM professional workforce preparation.

EHR and the Culture of Science

The FY 2013 proposed plan importantly reflects the EHR Directorate's serious commitment to the scientific study and evaluation of programs and research supported under its aegis. Under Program Monitoring and Assessment, the budget document shows a praiseworthy level of self reflection and innovation in undertaking evaluation cross-directorate within EHR on issues ranging from cyber-learning to preK-5 education. Building upon the substantive and methodological expertise in our science, the EHR plan includes two longitudinal studies—one to examine the long-term impact of the site experiences within the Research Experiences for Undergraduates (REU) Program on student participation in science and the other to study the impact of Graduate Research Fellowships (GRF) on recipients.

EHR's commitment to building model programs through R&D and evaluation is worthy of comment and praise. To enhance the REESE Program (*Research and Evaluation on Education in Science and Education*), in 2008, EHR provided support to establish the Center for Advancing Research and Communications in Science, Technology, Engineering, and Mathematics (ARC) at NORC at the University of Chicago. ARC works with over 300 REESE investigators across the U.S. as they aim to improve education policy, instruction, and learning, in and outside of formal classroom settings. Over the past year, with EHR's encouragement and support, ARC has developed *Criteria and Guidelines for Rating the Methodological Rigor of REESE Projects*. Beyond the REESE Program (to be renamed *Research on Education and Learning* [*REAL*] in FY 2013), this kind of initiative reflects the broader commitment within NSF and EHR to quality science and standards that promote it.

NSF/EHR as Prudent Steward of Resources

The FY 2013 proposed budget and plan for EHR constitutes a $46.61 million (5.6 percent) increase over the 2012 estimate. This increase is modest in absolute and real terms and shows a commitment to serious rethinking within EHR and NSF about how to use funds and reframe investments in an effort to build the scientific knowledge base that can reestablish U.S. preeminence in STEM education and workforce development in the 21st Century.

The budget request of $875.6 million is a 1.7% increase over fiscal year 2011 (since EHR had a reduction of budget in the FY 2012 estimated budget). Taking a longer view, it is noteworthy that the Directorate has worked prudently with the limited resources it has received, reflecting the difficult economic times that our citizens and our Nation face. In constant dollars, the FY 2013 request is -2.3% below the 2006 budget appropriation.

Conclusion

In conclusion, AERA believes that the new focus on core research and development programs provides a comprehensive strategy for addressing the major challenges of STEM education: providing meaningful access to all of our children, offering curricula and pedagogy based on rigorous research, understanding the dynamics of the STEM workforce, improving undergraduate education, and scaling up across the board.

We see the plan as revealing innovative thinking based on coupling sustained research with advances in STEM education. We urge the committee to look favorably on this request as a modest one to support a well developed and compelling plan.

Thank you for providing this opportunity to support the budget request and strategy. Please call on us if we can provide additional information regarding this budget proposal.