Conceptual Framework for New Science Education Standards

Committee

Helen R. Quinn

Chair

Helen R. Quinn is professor of physics at Stanford Linear Accelerator Center. Dr. Quinn is a theoretical physicist who was inducted into the National Academies in 2003. She served as the president of the American Physical Society in 2004. In addition to her scholarship in physics, Dr. Quinn has had a long term involvement in science education and in the continuing education of science teachers. She was an active contributor to the California State Science Standards development process. She is a former president and founder of the non-profit Contemporary Physics Education Project. She served as chair of the Review and Evaluation of NASA's Pre-College Education Program Committee. She has been a member of the Committee on Science Learning, K-8; the Federal Coordinating Committee on Science, Mathematics and Technology Education, as well as, the Center for Education Advisory Board. She received a Ph.D. in physics from Stanford University in 1967.

Wyatt W. Anderson

Member

Wyatt W. Anderson is the Alumni Foundation Distinguished Professor in the genetics department at the University of Georgia. He is also a member of the National Academy of Sciences. His research interests include evolutionary genetics of mating behavior and chromosomal polymorphisms of Drosophila species; evolutionary genomics of Drosophila; science education and minority participation in college science curricula. He has served on a number of NRC committees, including Section 27: Evolutionary Biology, Committee to Review Northeast Fishery Stock Assessments, and Committee on the Release of Genetically Engineered Organisms into the Environment. He earned his B.S. in Molecular Evolution and his M.S. in Pop. Genetics and Pop. Biology from the University of Georgia. He earned his Ph.D. in Science Literacy and Education from the Rockefeller University.

Tanya M. Atwater

Member

Tanya Atwater is a Professor of Tectonics at the University of California, Santa Barbara. Dr. Atwater's research has concerned various aspects of tectonics, ranging from the fine details of sea floor spreading processes to global aspects of plate tectonics. She has participated in or led numerous oceanographic expeditions in the Pacific and Atlantic Oceans, including twelve dives to the deep sea floor in the tiny submersible, Alvin. She is especially well known for her works on the plate tectonic history of western North America, in general, and of the San Andreas fault system, in particular, work that is presently taking her in exciting new directions. Dr. Atwater is devoted to science communication, teaching students at all levels in the University, presenting numerous workshops and field trips for K-12 teachers, consulting for the written media, museums, TV and video producers, etc. Dr. Atwater serves on various national and international committees and panels. She is a fellow of the American Geophysical Union and the Geological Society of America and was a co-winner of the Newcomb Cleveland Prize of the American Association for the Advancement of Science and was elected to the National Academy of Sciences in 1997. She received her education at the Massachusetts Institute of Technology, the University of California at Berkeley, and Scripps Institute of Oceanography, completing her PhD in 1972.

Philip Bell

Member

Philip Bell is an associate professor of the Learning Sciences at the University of Washington where he directs the ethnographic and design-based research of the Everyday Science and Technology Group (http://everydaycognition.org). He also directs the University of Washington Science and Mathematics Learning Institute that focuses on coordinating P-20 education efforts across the university. Dr. Bell has studied everyday expertise and cognition in science and health, the design and use of novel learning technologies in science classrooms, children's argumentation, the use of emerging digital technologies within youth culture, and new approaches to inquiry instruction in science. He is a co-lead of the Learning in Informal and Formal Environments (LIFE) Center (http://life-slc.org/) and is a Co-PI of COSEE-Ocean Learning Communities (http://cosee-olc.org/). Dr. Bell is a member of the NRC’s Board on Science Education and he co-chaired the consensus Committee on Learning Science in Informal Environments. He has a background in human cognition and development, science education, computer science, and electrical engineering. He earned his Ph.D. in Education in Human Cognition from the University of California, Berkeley.

Thomas B. Corcoran

Member

Thomas B. Corcoran is co-director of CPRE at Teachers College, Columbia University. He has been a state policymaker, a designer of programs to improve teaching, a researcher, an evaluator, and an advisor to governors, state legislatures, foundations, and reform organizations. His research interests focus on the linkages between research and practice, the use of evidence-based instructional practices, design of knowledge transfer systems for public education, the effectiveness of professional development, and the impact of changes in work environments on the productivity of teachers and students. He heads the Center on Continuous Instructional Improvement, funded by the Hewlett Foundation and Teachers College projects in Jordan and Thailand. He is the author of several books and numerous papers, articles, and book chapters. Since 1998 he has taught policy analysis at the Woodrow Wilson School of International and Public Affairs at Princeton University. Mr. Corcoran earned an M.Ed. from the University of London.

Rodolfo Dirzo

Member

Rodolfo Dirzo is a professor of biology at Stanford University. Dr. Dirzo is one of the world's leading tropical forest ecologists and conservation biologists. He has performed seminal work on the evolution of plant-animal interactions. He carried out classical experimental studies on the ecosystem significance of biodiversity loss, fragmentation, and deforestation. He is a foreign associate of the National Academy of Science. He served as a member on the U.S. National Committee on DIVERSITAS. Dr. Dirzo has been awarded the Presidential Award in Ecology, Secretary of Environment, Mexico; the Pew Scholar in Conservation, The Pew Charitable Trust; and the Outstanding Service Award: Teaching, Organization for Tropical Studies. He earned his M.Sc. and his Ph.D. from the University of Wales Aberystwyth.

Phillip A. Griffiths

Member

Phillip A. Griffiths is director emeritus and professor of mathematics at the Institute for Advanced Study (IAS), which he led from 1991 to 2003. He was formerly provost and James B. Duke Professor of Mathematics at Duke University and professor of mathematics at Harvard. Over the last four decades, Phillip Griffiths has been a central figure in mathematics. He has made crucial contributions in several fields, including complex analysis, algebraic geometry, and differential systems. Dr. Griffiths chaired the committee that produced the Carnegie Corporation report “The Opportunity Equation.” Dr. Griffiths served on the National Science Board from 1991-1996. He is a member of the National Academy of Sciences and a Foreign Associate of the Third World Academy of Sciences. Dr. Griffiths has served as a member, ex-officio member, and chair for numerous NRC committees, including the Mathematical Sciences Education Board; Committee on Science, Engineering and Public Policy; Center for Science, Mathematics and Engineering Education Advisory Board; and the U.S. National Committee for Mathematics. He is currently a member of the NRC Board on African Science Academy Development. He received his M.S. in mathematics from Wake Forest University and his Ph.D. in mathematics from Princeton University.

Dudley R. Herschbach

Member

Dudley R. Herschbach is an Emeritus Professor in the Department of Chemistry and Chemical Biology at Harvard University. He won the 1986 Nobel Prize in Chemistry jointly with Yuan T. Lee and John C. Polanyi for their contributions concerning the dynamics of chemical elementary processes. Dr. Herschbach has been a strong proponent of science education and science among the general public, and frequently gives lectures to students of all ages, imbuing them with his infectious enthusiasm for science and his playful spirit of discovery. He is engaged in several efforts to improve K-12 science education and public understanding of science. He is a board member of the Center for Arms Control and Non-Proliferation and is the chairman of the board for Society for Science & the Public. Dr. Herschbach is a member of the National Academy of Sciences. He has served on the NRC Committee on Education and Employment of Women in Science and Engineering; the Panel for National Science Education Standards and Television Project; and the Board of Overseers and the Communications Advisory Committee. Dr. Herschbach received an B.S. in mathematics and an M.S. in chemistry from Stanford University. He earned an A.M. in physics and a Ph.D. in chemical physics from Harvard University.

Linda P. Katehi

Member

Linda P.B. Katehi is chancellor of the University of California, Davis. Previously, she served as provost and vice chancellor for academic affairs at the University of Illinois at Urbana-Champaign; the John Edwardson Dean of Engineering and professor of electrical and computer engineering at Purdue University; and associate dean for academic affairs and graduate education in the College of Engineering and professor of electrical engineering and computer science at the University of Michigan. Professor Katehi led the effort to establish the Purdue School of Engineering Education, the first department at a U.S. university focused explicitly on engineering education, particularly on K–12 engineering curricula, standards, and teacher education. The author or coauthor of 10 book chapters, she has published more than 600 articles in refereed journals and symposia proceedings and owns 16 patents. She is a member of the National Academy of Engineering (NAE), a fellow and board member of the American Association for the Advancement of Science, chair of the Nominations Committees for the National Medal of Science and National Medal of Technology and Innovation, and a member of the Kauffman National Panel for Entrepreneurship. She is currently a member of a number of NAE/National Academy of Sciences committees and the Advisory Committee for Harvard Radcliffe College and a member of the Engineering Advisory Committees for Caltech, the University of Washington, and the University of California, Los Angeles.

John C. Mather

Member

John C. Mather is a senior astrophysicist at the U.S. space agency's (NASA) Goddard Space Flight Center in Maryland and adjunct professor of physics at the University of Maryland, College Park. Dr. Mather won the Nobel Prize in Physics for his work on the Cosmic Background Explorer Satellite (COBE) with George Smoot. COBE was the first experiment to measure the black body form and anisotropy of the cosmic microwave background radiation helping to cement the big-bang theory of the universe. In 2007, Dr. Mather was listed among Time magazine's 100 Most Influential People in The World. Dr. Mather is also the project scientist for the James Webb Space Telescope, a space telescope to be launched to L2 no earlier than 2013. He was a member of the NRC Board on Physics and Astronomy; he served on the Committee on Physics of the Universe. He earned his B.A. in Physics from Swarthmore College and his Ph.D. in Physics from the University of California, Berkeley.

Brett D. Moulding

Member

Brett P. Moulding is the director of the Utah Partnership for Effective Science Teaching and Learning, a five district professional development collaborative. He was the director of curriculum and instruction at the Utah State Office of Education before retiring in January of 2008. He was the state science education specialist and coordinator of curriculum from 1993 to 2004. He taught chemistry for 20 years at Roy High School in the Weber school district and served as the district science teacher leader for eight years. Moulding received the Governor's Teacher Recognition Award, the Presidential Award for Excellence in Mathematics and Science Teaching and the Award of Excellence in Government Service from the Governor's Science and Technology Commission. He served on the Triangle Coalitional Board, the NAEP 2009 Framework Planning Committee and was the president of the Council of State Science Supervisors from 2003 - 2006. Mr. Moulding has been a member of the NRC's Board on Science Education since 2005. He is a member for the Committee on the Review of NOAA's Education Programs and served on the NRC's Committee on the Review and Evaluation of NASA's Pre-College Education Program. He received his Administrative Supervisory Certificate from Utah State University. Mr. Moulding earned a B.S. in chemistry from the University of Utah, Salt Lake City, and a M.Ed. from Weber State University, Ogden, UT.

Jonathan Osborne

Member

Jonathan Osborne holds the Shriram Family Professorship in Science Education at Stanford University. Prior to joining Stanford, he was a professor of science education at King's College, University of London. His research focus is a mix of work on policy and pedagogy in the teaching and learning of science. In the policy domain, he is interested in exploring students' attitudes toward science and how school science can be made more worthwhile and engaging, particularly for those who will not continue with the study of science. In pedagogy, the focus has been on making the case for the role of argumentation in science education both as a means of improving the use of a more dialogic approach to teaching science and improving student understanding of the nature of scientific inquiry. He led the project on 'Enhancing the Quality of Argument in School Science Education,' from which IDEAS (Ideas, Evidence and Argument in Science Education) materials to support teacher professional learning were developed. Dr. Osborne was one of the partners in the NSF funded Centre for Informal Learning and Schools. He earned his Ph.D. in education from King's College, University of London.

James W. Pellegrino

Member

James W. Pellegrino is liberal arts and sciences distinguished professor of cognitive psychology and distinguished professor of education at the University of Illinois at Chicago (UIC). He is co-director of UIC's interdisciplinary Center for the Study of Learning, Instruction, and Teacher Development. Dr. Pellegrino's current work is focused on analyses of complex learning and instructional environments, including those incorporating powerful information technology tools, with the goal of better understanding the nature of student learning and the conditions that enhance deep understanding. A special concern of his research is the incorporation of effective formative assessment practices, assisted by technology, to maximize student learning and understanding. Dr. Pellegrino has served on the NRC Board of Testing and Assessment and co-chaired the Committee on the Cognitive Science Foundations for Assessment, which issued the report Knowing What Students Know: The Science and Design of Educational Assessment. He recently helped the College Board build frameworks for curriculum, assessment and professional development in AP Biology, Chemistry, Physics, and Environmental Science. Dr. Pellegrino earned his B.A. in psychology from Colgate University, Hamilton, New York and both his M.A. and Ph.D. from the University of Colorado.

Stephen L. Pruitt

Member

Stephen L. Pruitt is the chief of staff for the Office of the State Superintendent of Schools in the Georgia Department of Education. Mr. Pruitt is the current president of the Council of State Science Supervisors. Before joining Georgia’s Department of Education he taught high school science for 12 years. Mr. Pruitt supervised the revision and implementation of Georgia’s new science curriculum. The Georgia Performance Standards have taken Georgia in a new direction in education with an emphasis in conceptual learning and inquiry. He has served in the position of Director of the Division of Academic Standards where he supervised the implementation of all content areas’ new curriculum. He now serves as the Interim Associate State Superintendent for Assessment and Accountability where he supervises the development and operation of all state testing and Adequate Yearly Progress determinations. Mr. Pruitt received an B.S. in Chemistry from North Georgia College; and an M.Ed. from State University of West Georgia. He is currently completely a Ph.D. in chemistry education from Auburn University.

Brian Reiser

Member

Brian Reiser is a professor of learning sciences at Northwestern University. Dr. Reiser’s research concerns the design and study of investigation environments and inquiry support tools for science education. The goal of this work is to develop a model of "reflective inquiry" and the pedagogical principles for its support. These projects explore the design of learning environments that scaffold investigation and scientific argumentation about biological phenomena and the design of inquiry support tools that help students organize, reflect on and communicate about the progress of their investigations. The empirical work conducted in urban middle school and high school classrooms investigates how students develop inquiry and argumentation skills and how effective teachers support student inquiry. This work is being conducted as part of the initiatives of the NSF Center for Learning Technologies in Urban Schools (LeTUS), which is working to understand how to make learning technologies a pervasive part of science classrooms in urban schools. Dr. Reiser served as a member on the NRC Committee on Science Learning, K-8, which published the consenus report Taking Science to School. He earned his Ph.D. in cognitive science from Yale University.

Rebecca R. Richards-Kortum

Member

Rebecca R. Richards-Kortum is the Stanley C. Moore Professor of Bioengineering at Rice University. Dr. Richards-Kortum is also a member of the National Academy of Engineering. Her work has focused on translating research that integrates advances in nanotechnology and molecular imaging with microfabrication technologies to develop optical imaging systems that are inexpensive, portable, and provide point-of-care diagnosis. This basic and translational research is highly collaborative and has led to new technologies to improve the early detection of cancers and other diseases, especially in impoverished settings. Over the past few years, Dr. Richards-Kortum and collaborators have translated these technologies from North America to both low- and medium-resource developing countries (Botswana, India, Taiwan, Mexico, and Brazil). Dr. Richards-Kortum has received numerous awards for her reseach and teaching, including: Presidential Young Investigator (1991) and Presidential Faculty Fellow (1992) awards from the National Science Foundation; the Becton Dickinson Career Achievement Award from the Association for the Advancement of Medical Instrumentation (1992); the Chester F. Carlson Award (2007) from the American Society for Engineering Education. She served on the inaugural National Advisory Council for Biomedical Imaging and Bioengineering for the National Institutes of Health (2002-2007), was elected fellow of the American Association for the Advancement of Science and Biomedical Engineering Society (2008). She served on the NRC Committee on Being a Scientist: Responsible Conduct in Research, 3rd Edition. She holds a Ph.D. in Medical Physics and an M.S. in Physics from Massachusetts Institute of Technology.

Walter G. Secada

Member

Walter G. Secada is the senior associate dean of the School of Education and the chair of the department of Teaching and Learning at the University of Miami. Prior to moving to UM, Dr. Secada was professor of curriculum and instruction at the University of Wisconsin—Madison and the director of Diversity in Mathematics Education. Dr. Secada's research interests have included equity in education, mathematics education, bilingual education, school restructuring, professional development of teachers, student engagement, and reform. Dr. Secada has been associate director and Co-PI of Promoting Science among English Language Learners (P-SELL) with a High-Stakes Testing Environment, associate director and Co-PI of Science Made Sensible; and a member of the University's Social Sciences Institutional Review Board at UM. Dr. Secada has worked on the development of a secondary-school mathematics and science academy at UM. As director of the U.S. Department of Education's Hispanic Dropout Project, he was senior author of its final report, No More Excuses. He earned a BA in philosophy from the University of Notre Dame, an M.S. in mathematics and Ph.D. in education, both from Northwestern University.

Deborah C. Smith

Member

Deborah C. Smith is an assistant professor in the Education and Science Education Department at Pennsylvania State University. Dr. Smith teaches elementary science methods, and doctoral courses in curriculum, the history and philosophy of science, and science teacher knowledge. She is a former preschool and elementary school teacher, with a background in biology. Her research focuses on how teachers and young children build communities of scientific discourses and practices in the early years of schooling. As part of her research on professional development, she has also co-taught with elementary teachers in Delaware, Michigan, and Pennsylvania. She was the author and co-PI on a five-year National Science Foundation grant to Lansing (MI) School District and Michigan State University, in which grade level groups of K-8 teachers studied scientific content, standards-based and reform-minded curriculum design, research-based teaching practices, and their students' learning. She served on the NRC's Teacher Advisory Committee, and was a consultant for the NRC's popular publication, Ready, Set, Science! Dr. Smith earned her M.A. from Harvard School of Education in Teaching Science Education. She received a Ph.D. in curriculum and instruction from the University of Delaware.