Chapter 3
What Works Clearinghouse, United States[1]

Robert Boruch, University of Pennsylvania
and Rebecca Herman, American Institute for Research

In this chapter, we outline the main features of the What Works Clearinghouse (WWC). The WWC was designed by the Institute of Education Sciences (United States) to provide educators, policy makers, researchers, and the public with a central and trusted source of scientific evidence on what works in education.

In the United States whenever a science has made remarkable advances, the government has formed new organisations to recognise, foster, and support the science. The creation of the Department of Agriculture, National Institutes of Health, the National Science Foundation, and the National Aeronautics and Space Administration are cases in point. The Institute of Education Sciences (IES), created under the Education Sciences Reform Act of 2002, is a new case in point. Its promise is as substantial as that of its older siblings.

The What Works Clearinghouse (WWC) is an IES initiative. The WWC was designed by IES to provide educators, policy makers, researchers, and the public with a central and trusted source of scientific evidence on what works in education.

WWC is not designed to endorse particular interventions. Rather its focus is on reviewing and summarising the evidence pertaining to the effects of educational interventions, notably evidence that permits causal inferences. Nor does the WWC conduct randomised field trials or quasi-experiments to estimate the effects of interventions. Rather, part of the mission is to assure that all reports on such studies in a WWC topic area are identified and screened for dependability of the evidence.

In what follows, we outline the main features of the What Works Clearinghouse as of 2006. The effort is evolving. Readers are encouraged to consult the WWC website – *http://whatworks.ed.gov* – for up-to-date information.

[1] The What Works Clearinghouse is funded (2001-2006), through a contract from the US Department of Education Institute of Education Sciences to the Campbell Collaboration and the American Institutes for Research, a Joint Venture. This report is about the *facts* on the Clearinghouse. The personal views expressed in this paper do not necessarily agree with the views of the US Department of Education, nor do they necessarily disagree.

The What Works Clearinghouse and embodiments of science

The WWC embodies science in at least three ways. The first concerns the WWC's attention to unbiased estimation of an intervention's effect. As a practical matter, this means the WWC puts randomised controlled trials at a high priority, a status these studies have had in medicine since the 1950s, and in employment, training, and welfare research since the 1970s.

Randomised trials produce fair comparisons because, at the outset, the children, or families, or schools, etc., who are involved in one intervention do not differ systematically from those that are involved in another intervention that is purported to be more effective.

The WWC's focus on unbiased estimates based on randomised trials does not preclude estimates based on quasi-experiments. But the WWC recognises that the results of quasi-experiments are frequently more equivocal than those based on randomised trials because sources of bias in the latter cannot always be identified, much less estimated (Duncan, Magnuson and Ludwig, 2004; Boruch, 1997). The WWC's emphasis on randomised trials accords with the IES emphasis on higher quality evidence about what works, especially randomised trials (US Department of Education, 2003a, 2003b).

The second embodiment lies in science's emphasis on cumulation of knowledge. As a practical matter, the WWC depends on state-of-the-art methods developed over the past 20 years in the science of systematic reviews. The WWC's aims are to search literatures so as to produce an unbiased assembly of studies, screen them on the basis of the trustworthiness of the scientific evidence they have produced, and analyse and synthesise the information so as to properly understand and communicate the results (see, for example, Lipsey and Wilson, 2001).

For education research in the United States, the WWC's approach to instantiating reliance on scientific evidence is unique. There is similar interest in other countries, of course. For instance, OECD reviews of education research in Mexico and the United Kingdom point out the value of scientific research as a basis for informing policy and practice. The World Bank's Operations Evaluation Department Biennial Conference in 2003 focused substantially and for the first time on randomised trials in education and other sectors.

Both the Cochrane Collaboration in health care (*http://www.cochrane.org*) and the Campbell Collaboration in the social, criminological, and education sectors are international (*http://www.campbellcollaboration.org*). Their cross-discipline efforts aim to advance higher standards of evidence in the review – and ultimately the production – of studies. The WWC has built on these international initiatives, and expects that these other initiatives will capitalise on the WWC's work. The WWC also builds on earlier efforts in the United States that transcended political squabbles and that depended on the interest of teachers, administrators, and researchers in learning what works, notably Herman *et al.* (1999).

The third way that the IES's What Works Clearinghouse embodies scientific standards is through the use of transparent decision rules and protocols, developed under the guidance of substantive and methodological experts. The What Works Clearinghouse's Technical Advisory Group (TAG) contributed to the early development of WWC study review standards, and individual TAG members help resolve technical issues as they arise. The WWC's reliance on independent peer review is basic to vetting

the quality of the reviews that the WWC products. The review production system relies on explicit, consistent protocols, coding guides, and technical guidance, and the work of expert teams, led by principal investigators who are themselves experts in the areas under review.

Assumptions and prospects

The success of the Institute for Education Sciences' What Works Clearinghouse depends on some things that are in the WWC's control and some that are not. The prospects, for instance, depend partly on the public appetite for good evidence on what works. The No Child Left Behind Act attaches high value to scientific evidence. But if public interest in good evidence diminishes, governmental support for producing good evidence might then also decline.

The WWC reviews reports on field studies rather than executing such studies. Consequently, the WWC has no direct control over the production of high-quality research on the effects of interventions, especially randomised trials. If the supply of such studies is cut short, the WWC mission might have to change. The WWC can and does, of course, encourage production of high quality field tests indirectly, partly by recognising the value of randomised trials and what appear to be good quasi-experiments, and by enhancing their visibility in its standards for reviewing the research. Further, the WWC operates a Help Desk to help researchers understand and apply WWC review standards in their own work.

The prospects for success depend heavily on resources, especially people, for the production of reviews of evidence. The intellectual resources include published work on standards of evidence and reporting on individual studies in the health sector, such as the CONSORT statement (Altman *et al.*, 2001), and advances in the social, behavioral, and education sciences that direct special attention to producing fair estimates of an intervention's effect (Boruch, 1997; Mosteller and Boruch, 2002; Sherman, 2003).

The intellectual resources include procedures, methodological advances in conducting meta-analyses and systematic reviews of impact evaluations, and standards that have been developed for assessing assemblies of studies and reporting systematic reviews of studies in health care (Moher *et al.*, 1999) and in the social, behavioral, and educational sectors (Cooper, 1998; Halvorsen, 1994). They also build on precedents such as Herman *et al.* (1999) in education and Chalmers (2003) in health care, among others.

Operating principles

Assuring the quality of evidence is the first of the WWC's operating principles, represented partly in the WWC's focus on scientific excellence. The first principle is embodied in the standards developed for assessing evidence that are posted on the WWC's website. A second operating principle requires the WWC to be procedurally and organisationally efficient. Identifying dependable studies from the morass is demanding and complicated; the task requires efficiency to serve the public interest. Because the WWC is exploring new terrain, a willingness and capacity to improve is a third operating principle. Technical issues, for instance, emerge often, and technical guidance documents are developed on a "case law" basis to facilitate reviews in particular domains of education research. Emphasising accessibility and transparency in organisation and

procedures, in identifying and explaining the evidential standards, and in efforts to improve constitutes a fourth operating principle under the contract.

The WWC's credibility depends on these basic operating principles, of course. But as an ancient Latin aphorism puts it, being virginal is not sufficient. One must also appear virginal. Independence in the sense of anonymous and independent peer review, for example, is a theme that is instantiated in the WWC operations. Science asks to be surpassed and outdated. Consequently, the WWC is attentive to the need for course correction as the knowledge base changes. Course corrections depend on everyone who contributes to WWC, include people in the IES, sibling organisations such as the Cochrane Collaboration in health and the Campbell Collaboration in the social sectors, and others who contribute to the effort. Some corrections depend on the critics of WWC's products, and critics are an important resource.

Contemporary history

The WWC's aims and operating principles, described above, were made explicit in a competitive contract that the IES awarded in 2001 to a joint venture of Campbell Collaboration (C2) and the American Institutes for Research (AIR).

During 2001-2003 in a process of incremental and demanding improvement, the WWC developed tools and standards for assessing quality of evidence. During 2002, the WWC's Technical Advisory Group (TAG) was assembled. The prospective members' knowledgeability about scientific evidence, including randomised trials and measurement, and the production of systematic reviews of evidence were crucial to their invitation to serve.

During 2004, the WWC undertook a pilot phase to test the application of WWC standards in the review area of Middle-School Math Curricula. While the pilot test affirmed the use of WWC standards in reviews, it did reveal major challenges in designing detailed reporting formats that would give WWC users, including practitioners and researchers, what they need to know about each study. The WWC website and WWC reports underwent at least three major changes and many smaller modifications to shape the WWC's presentation of review results.

During 2004-2006, the volume of production of reviews increased from one to seven topics: early childhood education, beginning reading, elementary school mathematics, dropout prevention, English language learners, character education, and updated reviews on middle school mathematics. All of these focused on named interventions – including programmes and practices – and were based on reviews of randomised trials and quasi-experimental designs that met WWC standards.

The WWC'S products

The WWC's reviews of evidence on education interventions, at two levels of reporting, are the WWC's most important products. The WWC's standards of evidence are a deeper level of product. They underpin all the WWC work. The WWC's Evaluator Register, another product, was designed to assure that capacity for generating higher quality evidence can be fostered and exploited well. The use of the reviews by policy makers, researchers, and practitioners is itself an important ultimate product of the effort.

Standards of evidence as a WWC product

A major theme underlying all standards enunciated by the What Works Clearinghouse is that one must be able to make causal inferences about what works and what does not work based on dependable evidence.

Operationally, this means that randomised trials get top priority. They are more dependable in making a causal inference about what works than quasi-experiments. This also means that quasi-experiments have a lower priority, and are designated as meeting a lower standard of scientific evidence in any reports produced by the WWC. Randomised trials with no serious problems in their design or execution are rated as by WWC "Meets Evidence Standards". Quasi-experiments that (1) match on a pretest (or a good proxy) and other appropriate matching variables or (2) covary on these measures are rated as "Meets Evidence Standards with Reservations". The phrase "with reservations" is intended to remind readers that a quasi-experiment cannot provide the assurance of unbiased estimates of difference that a randomised trial can other things being equal. The WWC is also exploring standards for dependability of regression discontinuity studies (which is a quasi-experimental design with especially strong causal validity) and single subject designs.

Beyond the broad rating, WWC reviewers also examine and describe certain features of studies to assure that the studies can be interpreted properly and reviewed accurately and uniformly. These features include descriptions of the intervention, outcome measures, study settings, subgroups tested, and analysis statistics. WWC, for example, encounters reports at times that do not contain basic statistical information such as variance within groups being compared. A study that does not provide enough information to compute – and verify – study authors' reported findings would be screened out. The WWC uses a uniform query to request the missing information from study authors in such cases so as to assure reviewers have all pertinent information.

The WWC's efforts to develop standards must confront the fact that we do not know the answers to some questions, and that we must be attentive to the accretion of empirical evidence that could help address such questions. Consider, for instance, a randomised trial in which children or families attrite from one arm of the trial at a 5% rate and in the second arm at a 20% rate. Is this potentially serious difference important enough to incorporate into a standard that directs attention to internal validity of a trial? Does it depend on a recruitment process and context? How do we take into account the continuously accumulating evidence on attrition rates from well-conducted trials, and then make judgments about the dependability of the evidence at hand? And how do we incorporate this into a standard? WWC is working on such issues and how to take new evidence into account.

The WWC standards underwent repeated scrutiny and modification during 2002-2005, based on the Technical Advisory Group, public comments, and comparisons to related standards in the medical arena. The earliest versions were eventually put aside because of complexity in presentation; many seasoned researchers could not understand them. The more transparent and up-to-date standards are given on the WWC website. The WWC also develops technical guidance to provide more detailed decision rules for operationalising the standards. For example, the WWC standards indicate that severe attrition is problematic. The related technical guidance explains what should be considered "attrition" and the levels at which attrition is problematic. The standards and technical guidance are periodically updated on the WWC website. The WWC is developing an archive of technical issues confronted in WWC reviews, their resolution,

and application of the resolution in WWC review standards. Readers are encouraged to see the site for the most recent version.

WWC Evaluator Register

In 2005, the WWC launched an Evaluator Registry that provides information about organisations and individuals that have the capacity to produce high-quality evidence on the effects of educational interventions. Entries to the register are based on registration by evaluators who provide information on their performance – for instance, in designing and executing trials and in having the products of their research and evaluations published in peer-reviewed scientific venues.

The intended consumers and their use of WWC products

The WWC aims to assure that its products are used by policy makers, practitioners, researchers, and others. The WWC understands that getting research used is no easy task. In the medical research arena, for instance, it takes 5 to 10 years for a tested innovation to be incorporated into practice. In the education arena, the results of Tennessee's class size trials were not recognised, much less used, by many policy people for over 5 years. The WWC would like to foster a brisker pace.

Because WWC depends on advances in the state of the art in conducting studies, and advances the state of the art in reviewing them, researchers are part of the target for WWC reviews. The WWC aims to vet ideas and products in peer-reviewed scientific forums. Consequently, papers covering some WWC activities have been developed for peer-reviewed journals such as the *Annals of the American Academy of Political and Social Sciences* (Turner *et al.*, 2003) and edited books.

The public and professional media are important, given the WWC's interest in assuring that teachers, parents, and policy makers can learn about and use the WWC's products. Media related information has been put up on the WWC's website. Such information and a broader communications strategy has led to new WWC reviews being covered frequently in the popular press and in trade journals such as *Education Week*.

Attracting attention to websites and assuring repeat visits can be a fiercely competitive enterprise. The WWC's website has undergone at least three major changes in the years since its creation, and WWC continues in its effort to improve. Nonetheless, one must confront the fact that there are hundreds, if not thousands, of websites that purport to tell "what works" on topics ranging from astrology to zoo keeping, and that the phrase is also common in sites that purport to provide evidence about education practice and policy. Despite the competition, the WWC website has substantial usage, with an average of over 1 300 unique visitors per day.

The WWC topics and workflow

The WWC aims to be as attentive to quality and as transparent as possible. Most important, the workflow includes quality control at repeated definable points.

At the first stage of the WWC's workflow, people submit their opinions about what topics, interventions, or studies ought to be reviewed by the WWC. The people who make submissions can include anybody – parents, teachers, executives in publishing houses,

researchers, or other individual or organisations who have an interest in discerning what works or who might benefit or suffer from a WWC review on what works. Candidate topics also are nominated in professorial forums to which WWC contributes. Certainly they also include advisors to the IES, including substantive area specialists.

The WWC's choice of a particular topic for review depends on (a) the relevance of the topic to current education policy and practice, (b) the topic's probable importance in decisions about what interventions can be adopted, and (c) the level of evidence available. These are complex interrelated criteria. Reaching decisions has involved assuring that different prospective users of information weigh in on the information they want: policy makers, practitioners, and researchers. As of 2006, the topics for review include Elementary-School Math, Middle-School Math, Dropout Prevention, Character Education, Beginning Reading, English Language Learning, and Early Childhood Education. Each topic has a review team consisting of a PI, project coordinator, and coders.

A WWC review in a topic area begins with detailed protocol, developed by the PI, that defines the intervention and inclusionary criteria, the target population including high-risk subpopulations, the outcome variables that are pertinent, and the study designs that are eligible for a WWC review under WWC standards.

The WWC's process for generating a review in a particular intervention area continues with comprehensive literature searches and full-text readings of published and unpublished reports. Outcome studies that depended solely on testimonials or simple correlations are eliminated at the outset, for example. Randomised trials and high-end quasi-experiments on relevant interventions were admitted to candidacy for WWC review.

When eligible studies are identified, the coding process begins with basic categorical distinction between randomised trials and quasi-experimental designs. For each category of study, characteristics that influence internal validity are identified. For instance, a randomised trial that has large difference in the attrition rate between intervention arms must be recognised. As a result, it might subsequently be downgraded to quasi-experimental status "Meets Standards with Reservations", in the absence of other information that speaks to the biases that such attrition could engender.

Characteristics of studies are double coded by two independent coders to assure that coding reliability can be estimated. Differences of opinion in coding are adjudicated by a principal investigator and a project coordinator. Principal investigators provide substantive expertise to professional review teams and weigh in on topic-specific decisions. Some people might expect that adjudication issues are few and take little time. That has not been the case. Adjudicating ambiguities in a report from a peer-reviewed journal can easily take hours. Because standards of reporting research in journals have changed, and because the WWC may cover up to 20 years of preceding research in a review area, the number of adjudicated cases can be large.

Draft Intervention Reports and Topic Level Reports are reviewed by members of the WWC Technical Review Team, anonymous peer reviewers who are engaged by the IES directly, and by senior IES staff. The aims of these external peer examinations are to assure accuracy in the WWC reports, to minimise ambiguity, and to verify uniform adherence to WWC standards.

Concluding remarks

The Institute of Education Sciences' What Works Clearinghouse (WWC) is unprecedented in its focus on the quality of evidence that is generated about the effects of education interventions and its focus on scientific standards in making judgments about evidence quality. It is also unprecedented, in education, for operationalising standards that are as public and transparent as possible, across a wide variety of topics. The WWC is unprecedented in creating an organisation, processes and procedures, and teams of people that are essential in developing reviews at this scale and with this level of transparency.

Despite lack of these precedents, the IES's Clearinghouse has depended heavily on experience and advances in understanding how to build scientific knowledge. This includes work over the last three decades on randomised trials so as to produce unbiased estimates of the relative effects of interventions. It includes scientific work over roughly the same period – in health care, criminology, and welfare, as well as education – to understand how to summarise the results of studies uniformly and against clear standards.

The aims are high and the products important. In identifying what works, the Clearinghouse will help us, as a fine aphorism suggests, to "Test all things and hold fast to that which is good."

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Biography

Adrienne Alton-Lee is the Chief Education Adviser for the New Zealand Ministry of Education's Iterative Best Evidence Synthesis (BES) Programme. Her role is to strengthen the evidence-base informing policy and practice in education and to provide medium term strategic advice to government. Dr. Alton-Lee is a Fellow of the International Academy of Education. She was formerly a teacher, classroom researcher, Professor and an Associate Editor of *Teaching and Teacher Education*. She has published in leading educational journals including the *Harvard Educational Review,* the *Elementary School Journal,* the *International Journal of Inclusive Education* and the *American Educational Research Journal.*

René Bugge Bertramsen is the Deputy General Director for the Danish University and Property Agency within the Danish Ministry of Science, Technology and Innovation. Since 1999 he has been involved in reforms aiming at enhancing the quality of the Danish educational R&D system (such as the establishment of the Danish Pedagogical University – DPU – and the R&D centre Learning Lab Denmark). Mr. Bertramsen was responsible for the University Act of 2003 which gave Danish universities a new governance system, *i.e.* boards with external majority and employed rectors, deans and department heads. In 2006-2007 he was responsible for a merger process where government research institutes were integrated with the universities and a number of single-faculty universities were merged with larger multi-faculty universities, including the merger of DPU with multi-faculty University of Aarhus.

Robert Boruch, Professor, University of Pennsylvania (USA). Dr. Boruch is current co-chair of the Steering Group of the International Campbell Collaboration, and principal investigator for the Institute of Education Sciences What Works Clearinghouse, which is designed to be a central and trusted source of information on evidence about what works in education. Dr. Boruch is an elected Fellow of the American Academy of Arts and Sciences, the American Statistical Association, and the Academy for Experimental Criminology. He has received awards for his work on evaluation policy, randomised trials, and on privacy of individuals and confidentiality in social research. Dr. Boruch's academic background is in psychology, statistics, and mechanical engineering, with degrees from Iowa State University and Stevens Institute of Technology.

Satya Brink is currently Director, National Learning Policy Research, Human Resources and Social Development Canada. She and her team are responsible for developing evidence in support of policy development for lifelong learning for the Government of Canada. This work includes analysis on outcomes for each age group and type of education as well as the impacts of earlier learning on subsequent learning. In her previous post, she was responsible for research on human development based on two major Canadian longitudinal surveys. During this time she and her team produced a major body of evidence based on the National Longitudinal Survey of Children and Youth which influenced major new initiatives of the Canadian government in support of children and their families.

Tracey Burns is a research and policy analyst for the Centre for Educational Research and Innovation, OECD, Paris. Previous to this she worked on social determinants of health across the life-span with Charles Ungerleider & Associates in Vancouver, Canada. As a Post-Doctoral Fellow at the University of British Columbia, Dr. Burns led a hospital-based research team investigating newborn infants' responses to language. Tracey Burns holds a BA from McGill University, Canada and PhD from Northeastern University, USA. She is the recipient of various awards and honours, including the UBC Post-Doctoral Fellowship, a student-nominated university teaching award, and the American Psychological Association Dissertation Research Award.

Thomas D. Cook is the Joan and Serepta Harrison Chair in Ethics and Justice and Professor of Sociology, Psychology, Education and Social Policy at Northwestern University, where he is also a Faculty Fellow at the Institute for Policy Research. He has a BA from Oxford University and a Ph.D. from Stanford University. He is interested in causal methods for the social sciences and in the joint effects of neighborhoods, schools, peers and families on how young people develop socially and cognitively. He is a Fellow of the American Academy of Arts and Sciences and the Margaret Mead Fellow of the American Academy of Political and Social Science. He has been awarded the Myrdal Prize for Science by the American Evaluation Association, the Donald Campbell Prize for Innovative Methodology by the Policy Sciences Organisation, and a Distinguished Research Scholar Prize of the American Psychological Association. He is the author or editor of 10 books and over 150 chapters and articles.

Jane Davidson is the Assembly Member for Pontypridd and former Deputy Presiding Officer for the National Assembly (Wales, United Kingdom). Since October 2000 she has been the National Assembly Education and Life-Long Learning Minister responsible for all aspects of education, training and lifelong learning. Educated at Malvern Girls' College, Birmingham University and the University of Wales, Jane has taught English, Drama and Physical Education. She is also an experienced youth worker and former Cardiff City Councillor. She was a member of the Arts Council for Wales and its Lottery Board, and Head of Social Affairs at the Welsh Local Government Association before her election to the Assembly. Jane has had a keen interest in education and youth work and is enjoying the challenges of the Education and Life-Long Learning portfolio.

Stephen Gorard holds the Anniversary Chair in Educational Studies at the University of York (United Kingdom), and directs the Centre for Research into Equity and Impact in Education. He is currently leading an Economic and Social Research Council (ESRC)-funded project promoting the use and understanding of randomised controlled trials in public policy (*http://trials-pp.co.uk/*), and was the originator of the ESRC's Research Capacity-building Network. He has published widely about the research process in social science, but his substantive work focuses on issues of equity, especially in educational opportunities and outcomes, and on the effectiveness of educational systems. Recent books include "Teacher supply: the key issues", "Adult learning in the digital age", "Overcoming the barriers to higher education", and "Schools, markets and choice policies".

David Gough is Professor of Evidence Informed Policy and Practice and Director of the Social Science Research Unit (SSRU) and its Evidence for Policy and Practice Information and Coordinating (EPPI) Centre, Institute of Education, University of London, United Kingdom. Previously he worked at the University of Glasgow and Japan Women's University. He directs the Methods for Research Synthesis node of the ESRC National Centre for Research Methods Node and research projects for the Department of

Education and Skills, the Teacher Training and Development Agency, the Social Care Institute of Excellence, and the Department for Work and Pensions. Dr. Gough is editor of the journal *Child Abuse Review* and associate editor of the journal *Evidence and Policy*.

Rebecca Herman, a principal research scientist at American Institute for Research (USA), specialises in setting standards for the quality of educational research and reviewing research based on those standards. As the project director for the What Works Clearinghouse, she is responsible for the US Department of Education's flagship project to identify effective educational programmes and practices. Dr. Herman was project director of the *Educators' Guide to Schoolwide Reform*. She provided congressional testimony and many invited presentations on this and related work. Dr. Herman holds an M.A. and Ph.D. in sociology from Johns Hopkins University.

Maria J.A. van der Hoeven is the Minister of Economic Affairs (Netherlands). Maria J.A. van der Hoeven was born in 1949. She was trained as a primary teacher and taught at schools of home economics and junior secondary commercial education. Thereafter she was head of the Adult Commercial Vocational Training Centre in Maastricht and of the Limburg Technology Centre. From 1991 to 2002 Ms. Van der Hoeven was a member of the House of Representatives for the Christian Democratic Alliance (CDA). She has held a variety of social and cultural posts. Ms. van der Hoeven served as Minister of Education, Culture and Science from 2002 until February 2007. She was appointed as Minister of Economic Affairs in early 2007.

David Hogan is currently Professor and Dean of the Centre for Pedagogy and Practice at the National Institute of Education, Nanyang Technological University in Singapore. Between 2004 and 2006 he was Vice Dean for Research at CRPP. Prior to that he was Professor of Education at the University of Tasmania in Australia, and before that he held appointments as Assistant and Associate Professor at the University of Pennsylvania in Philadelphia. He completed his PhD in the history of education at the University of Illinois in 1979. His current research interests focus on the intersections between research, policy and practice, pedagogical theory, curriculum theory and design, the design of knowledge management of innovation systems in schools, multi-level and longitudinal modeling of student outcomes, citizenship and education, and education and social theory.

Bill Kilgallon, OBE, has been the Chief Executive of the UK's Social Care Institute of Excellence since 2003. Prior to that he was Chief Executive of St Anne's Community Services from 1978 to 2002, an organisation he founded in 1971, which works with single homeless people and people with learning disabilities, mental health problems and alcohol and drug problems across Yorkshire and the North East. He was Chair of the Leeds Teaching Hospitals NHS Trust, the largest NHS Trust in the country from 1998-2002 and Chair of the Leeds Community & Mental Health Services NHS Trust from 1992-1998. Bill Kilgallon served as a member of Leeds City Council from 1979-1992 where he chaired the Social Services, Housing and Environment Committees. He has led independent inquiries, including one into alleged abuse in a local authority children's service and one into the management of an NHS hospital for people with learning disabilities.

Hannele Niemi is Professor of Education (1998-) and Vice-Rector for academic affairs at the University of Helsinki, Finland (2003-). She has been Professor of Education in Oulu, Turku and Tampere Universities (1987-1998). She has been a member of the Standing Committee of Social Sciences of ESF, the Council for Society and Culture in the Academy of Finland, and the Scientific Council of the University of Helsinki. She is a Steering Committee member of the British national research programme on teaching and

learning (TLRP). She was Director of the Finnish national research programme "Life as Learning" 2002-2006. Dr. Niemi has been Chair or a researcher in many national and international evaluation projects for development of educational research and teacher education. Her main research interest areas are teachers' professional development, moral education and technology-based learning environments.

Johnny Nilsson is the Former Secretary of State for Education in Sweden.

Andrew Pollard is Director of the Economic and Social Research Council's Teaching and Learning Research Programme (*www.tlrp.org*), the UK's largest coordinated initiative for educational research. As a teacher, his career started in Yorkshire primary schools and he has worked in teacher education or research at Oxford and Bristol Polytechnics and the Universities of the West of England, Bristol, Cambridge and London. He is presently based at the Institute of Education London. Andrew Pollard has published widely, including work on longitudinal ethnography and analysis of social factors in teaching and learning, learner perspectives, and resources for teacher education and school practitioners. He is at present working on an analysis of learning experiences through secondary education.

Rien Rouw is senior policy advisor at the Dutch Ministry of Education, Culture and Science (Department for General Strategic and Economic Advice). He is secretary of the Knowledge Chamber.

Tom Schuller is Head of the Centre for Educational Research and Innovation (CERI), OECD, Paris. Formerly Dean of the Faculty of Continuing Education and Professor of Lifelong Learning at Birkbeck, University of London, his latest books are *The Benefits of Learning: The Impact of Education on Health, Family Life and Social Capital* (RoutledgeFalmer, 2004) and *International Perspectives on Lifelong Learning* (edited with David Istance and Hans Schuetze, Open University Press, 2002).

Hans Stegeman is senior policy advisor at the Dutch Ministry of Education, Culture and Science (Department for International Policy). He is member of the OECD's Education Policy Committee.

Charles Ungerleider is Director of Research and Knowledge Mobilisation for the Canadian Council on Learning. From 1998 until 2001, Dr. Ungerleider served as Deputy Minister of Education for the Province of British Columbia, Canada. Prior to this he was Associate Dean for teacher education (1993-1998) at the University of British Columbia. Dr. Ungerleider has studied and written about educational policy and governance, student assessment, inter-group relations, and the impact of media on Canadian society. His most recent book *Failing Our Kids: How we are ruining our public schools* provides a critical analysis of the state of public schooling in Canada, the key part schooling plays in fostering Canadian values, and how public schools are treated by parents, professionals, and politicians.

Jerzy Wiśniewski is a consultant in education, and public administration and an expert of the Center for Social and Economic Research (Poland). From 2003-2006 he served as head of Strategy and Structural Funds of the Ministry of Education. He was also Director General of the Polish Ministry of National Education at the time of launching the reform of the education system, as well as the head of the International Department of the Ministry of Education and project manager in the Foundation for Public Administration Development. He was a member of the CERI/OECD Governing Board as well as the OECD team reviewing the educational system in Lithuania, advised the Ukrainian Ministry of Education on the reform of the system, and led the team reviewing the VET system in Croatia (with the European Training Foundation).

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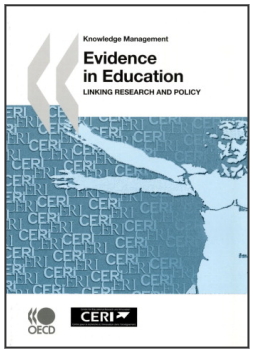

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