# Preface

Evaluation is in a state of flux. Perspectives of what it is, what it has been, and where it is going are changing, in general, and in science and technology education, in specific. Evaluation is no longer just a service or process, it is in the realm of a 'near discipline' (Worthen, 1994) or what has been referred to as 'trans-discipline' (Scriven, 1994). Evaluation has matured as a field as indicated by the existence of professional evaluation groups (the American Evaluation Association, and international, and state associations) and many high quality journals that deal with evaluation issues and research.

In terms of methodology, evaluation has evolved in dramatic fashion. Evaluators now include in their tool boxes concept mapping, evaluability assessment, tree diagrams, alternative and authentic assessment, logic models, and numerous methods for assessing needs. They have also moved far beyond the methodological focus to the consideration of other concepts such as the impact of contextual factors on programs and how findings are utilized to make decisions.

Another example of change in evaluation is the increased demand for accountability that is evident in statewide testing programs, the release of school achievement results to the general public, and the Government Performance and Results Act (GPRA). Collectively, there is growing pressure on educators to carefully evaluate both the outputs and outcomes of their programs. Science education is under the same intense public scrutiny as other areas of education (e.g., technology) and will increasingly need evaluation to help make its case in the public arena.

The background just described prompted our decision to undertake this book. We saw the beginning of the third millennium as an opportunity

to explore the current state of evaluation in science education and technology, and what lies ahead for it.

## GOAL OF THE BOOK AND INTENDED AUDIENCES

The goal of this book is to examine how evaluation has functioned in the past and the potential and exciting roles it could play in the future for science education and technology. The book deals with the following overarching themes in evaluation; Evaluation of Reform Efforts, Evaluation of Science, Evaluation of Technology; Evaluation of Process and Achievement; Evaluation of Teacher Training Programs; Policy; Research and Methodology.

The book is intended for a number of different yet overlapping audiences. First and foremost would be evaluators charged with providing information about the implementation and results of science and technology education programs and individuals who teach evaluation at universities. We believe that our choice of authors and topics produced extremely challenging ideas and very useful information for these two groups. The second audience consists of policy analysts, decision-makers, and legislators who are actively engaged in making educational choices for the future. How programs have been evaluated, how they will be evaluated in the future, and the nature of evaluation results should be of great value to this type of audience. The third constituency consists of teachers, curriculum specialists, and department heads in schools and school systems who have to make some of the hard choices regarding science and technology education.

## OUR CHARGE TO THE CHAPTER AUTHORS

Authors were chosen based upon their experience, knowledge, and publications in science education and evaluation. A large number of them are immediately recognizable as leaders in science and technology education and/or evaluation. Others will become so in the near term.

In devising chapter outlines, we could have been prescriptive and controlling. That would have been the worst thing to do and would have defeated our intent. Instead, we tried to capitalize on the strengths of our authors by sparking their imaginations and encouraging them even to the point of 'going out on a limb.' We think we succeeded but, of course, not us but you, the readers of this book, are the ultimate, unbiased judges as to whether or not such perceptions are warranted.

The general instructions given were to consider what had been done in evaluation in the specific focus of the chapter and then to speculate on

what the future might hold for evaluation. In some cases, the authors springboarded from our admittedly brief guidelines into wholly new, unanticipated, and exciting directions. We are pleased that they did so and that they had the confidence in us to exercise this freedom. We sincerely hope that you agree that they have pushed the creative envelope.

## ORGANIZATION OF THE TEXT

The book begins with a Foreword written by Daniel Stufflebeam of the Evaluation Center at Western Michigan University. Stufflebeam has been an internationally recognized leader in the field of evaluation for more than 35 years. Aside from his faculty duties he has just added an entire issue of New Directions in Evaluation (2001) to his extensive list of evaluation publications. It is devoted to a thoughtful examination of evaluation models. He currently serves on the Board of the American Evaluation Association.

## CHAPTER 1
## WHAT DOES THE FUTURE HAVE IN STORE FOR THE EVALUATION OF SCIENCE AND TECHNOLOGY EDUCATION?

James Altschuld and David Kumar (of The Ohio State University and Florida Atlantic University, respectively) analyze and summarize the ideas and concepts produced by the knowledgeable and well versed slate of chapter authors. Rather than placing a chapter like this at the end of the book as is usually done, it is better up front. It is derived from an analysis of all of the chapters especially in regard to important themes that seemed to cut across them. For example: what can we learn from the chapter authors? what are the challenges facing science and technology education and how will evaluators collect and provide information that is useful for program improvement? what guidance can we offer a new generation of evaluators?

## CHAPTER 2
## WHAT ROLE SHOULD TIMSS PLAY IN THE EVALUATION OF U.S. SCIENCE EDUCATION?

William Schmidt and HsingChi Wang (of Michigan State University) explore the role of TIMSS (Third International Mathematics and Science Study) in evaluation. In particular, they view TIMSS as a mechanism for

thinking about the nature of the U.S. system of education as a whole and for influencing policymaking bodies.

## CHAPTER 3
## EVALUATING SYSTEMIC REFORM: EVALUATION NEEDS, PRACTICES, AND CHALLENGES

Bernice Anderson of the National Science Foundation has informed us of the complexity and subtlety of evaluating major science education reform endeavors. Her chapter deals with a sobering reminder of just how difficult it is to define what we mean by reform, to develop strategies and models to guide evaluations, to specify the critical variables to be studied, and to carry out the overall evaluations. The chapter is rich in examples and illustrates the fact that evaluating the success or failure of reform is filled with exciting challenges yet daunting at the same time.

## CHAPTER 4
## MUSINGS ON SCIENCE PROGRAM EVALUATION IN AN ERA OF EDUCATIONAL ACCOUNTABILITY

Dennis Cheek of the Rhode Island Department of Education and the University of Rhode Island discusses a view of accountability systems as technologies of social control. He then proceeds to describe both the assumptions and reasons for testing as well as the design flaws in state testing programs and the impact of testing programs at the school level. Lastly, he argues for better assessment of student achievement.

## CHAPTER 5
## ASSESSMENT REFORM: A DECADE OF CHANGE?

Wendy McColskey of SERVE (Southeast Regional Vision for Education located in Greensboro) and Rita O'Sullivan of the University of North Carolina (Chapel Hill) are evaluators who have been training teachers (especially science teachers) in developing and using alternative assessment procedures in their classrooms. Their chapter looks at the national and state level tests, but then rapidly moves to the classroom as the main arena for action especially in regard to teacher training for assessment. It is in the classroom that meaningful, more authentic assessment takes place with the ensuing result that teachers become more reflective

learners about their own teaching efforts. This counterpoint should make all of us more reflective of evaluation in science education.

## CHAPTER 6
## EVALUATION OF INFORMATION TECHNOLOGY

John Owen, Gerard Calnin, and Faye Lambert of the University of Melbourne in Australia have helped us to understand the difficulty of evaluating what seems like a straightforward and simple undertaking, that of introducing technology (information technology) into classrooms. They show us that there are problems in defining the construct (it has many meanings) as well as evaluating its implementation and effectiveness. They also identify the need to delve into the contexts of the classroom and school to operationalize an information technology instructional system in science education.

## CHAPTER 7
## COMPLEMENTARY APPROACHES TO EVALUATING TECHNOLOGY IN SCIENCE EDUCATION

David Kumar of Florida Atlantic University and James Altschuld of The Ohio State University primarily look at two ways of evaluating a teacher training program that relied on the extensive use of technology. One group of evaluators (Barron et al., 1993) used what might be termed standard methods for conducting an evaluation, whereas, the other applied a context evaluation framework to the same situation. The two evaluations generated quite distinct yet complementary results and helped to raise a number of questions and issues about how technology intensive projects could be evaluated.

## CHAPTER 8
## EVALUATION OF SCIENCE TEACHING PERFORMANCE THROUGH COTEACHING AND COGENERATIVE DIALOGUING

Kenneth Tobin and Wolff-Michael Roth (of the Universities of Pennsylvania and British Columbia, respectively) ask us to reexamine the basis of traditional thought regarding how science teachers are evaluated and trained. They offer a strikingly different view as to how to think about the evaluation of novice teachers and the procedures normally employed in