

# Preface

## **PURPOSE OF THE BOOK**

If you are going to teach in an inquiry-based, content-rich way, how will you think about and facilitate assessment? This book is intended to provide you with the opportunity to examine your beliefs about the purposes of your own classroom assessment strategies and to contemplate the idea of formative assessment and how it fits into the larger view of other types of assessment. We hope you will consider how what we call “continuous” assessment can improve your interactions with your students and help you reflect on your own practices.

Our hope is that the descriptions, stories, strategies, and tools featured in this book will spark your interest and encourage you to examine your assumptions about teaching, learning, and assessment, and how these beliefs affect your students. Rather than prescribe recipes for success, the contents of this book are meant to stimulate your thinking. We hope they will inspire you to adapt the suggestions for facilitating science inquiry through continuous assessment to your own unique circumstances. We hope that by doing so you will experience the delight and growth in understanding that comes from listening to and engaging deeply with students. We hope that your efforts will catalyze meaningful changes in your students’ thinking and learning. We also predict that once you employ these strategies in science, you will be prompted to use them to enhance teaching and learning in other disciplines.

## **RESEARCH BASE FOR THE BOOK**

This book represents the authors’ twelve years of intensive experience helping teachers integrate ongoing formative assessment with an inquiry approach to science. Funded by the National Science Foundation, our work is grounded in research about effective science teaching and learning conducted by the National Center for Improving Science Education, the National Research Council, and other science education reform initiatives. Specifically, we draw on the vision provided by the National Science Education Standards, which call for dramatic changes in instruction, assessment, and professional development,

## **xii • Weaving Science Inquiry and Continuous Assessment**

and that describe a way of science teaching and learning that reflects how science itself is done. That is, using an inquiry approach builds an understanding of the natural world; reflecting on both the inquiry process and the new understandings helps both the student and you, yourself, to grow.

Specifically, this book highlights learnings from the Continuous Assessment in Science Project (CASP) from 1995 to 1997, and a professional development materials grant: Strengthening Science Inquiry, Assessment and Teaching, from 1998 through 2002, both funded by the National Science Foundation. The CASP grant grew out of our belief that traditional end assessments do not accurately reflect the richness of the inquiry process, the growth in students' conceptual understandings, and the use of scientific processes and dispositions that occur throughout the learning process. Thus, the grant focused on helping teachers develop methods for assessing students' growth while facilitating science inquiry in the elementary and middle grades.

The methodology for this research included the efforts of forty-one teachers from thirteen schools as they participated in CASP. Together they helped us research and develop methods for assessing student learning that (a) were aligned with inquiry teaching and learning, (b) would accurately and completely represent students' growth in the concepts, processes, and dispositions of science, and (c) would allow for student engagement in the assessment process. These teachers collected data on how and what students were learning as they engaged in inquiry-based science in their classrooms. In a classroom research style, teachers determined questions about science teaching and learning that intrigued them, gathered data, and wrote about their observations and findings. Participants developed and tested a range of strategies and tools to facilitate student inquiry and document student progress. They also learned to analyze and use the data they gathered to monitor student growth, to adjust instruction to better meet students' developmental needs, to take student learning deeper, and to reflect on and improve their own practice.

This book presents a synthesis of the specific learnings of this project within the broader context of the authors' work in science education reform.

### **AUDIENCE FOR THE BOOK**

This book is written primarily to the practicing teacher. It builds on what you already do—make decisions about instruction as you observe and listen to students—and suggests how to use this approach more deliberately to improve science teaching and learning in your classroom. Stories and suggestions from other fellow teachers in a range of classroom contexts reveal how you can use techniques such as “scientists' meetings” to facilitate science inquiry and conversations. They suggest how you can listen carefully and document student

understanding and skills, then use the information gathered to deepen student learning. The stories featured in this book also reveal how striving to better understand, document, and guide students' thinking and learning will enhance your professional growth. Finally, the book will help you explore how to plan for the kind of professional development that can help you incorporate new approaches for facilitating and assessing inquiry-based teaching and learning.

If you are a professional development provider or administrator, the book can help you in your practices with teachers to integrate continuous assessment with science education and to use the resulting data to report students' progress. We hope that it will also help parents, community members, and policymakers to recognize the value of gathering and using this authentic classroom data at the local level for monitoring student growth, improving instruction, and helping teachers grow professionally.

## BOOK ORGANIZATION

In writing this book about inquiry and continuous assessment, we quickly realized that while there are many good resources to help you understand inquiry, there is much less information about the type of formative assessment called for by the nature of inquiry itself. Therefore, in this book, we make the assumption that readers have a basic understanding of inquiry, and we concentrate our efforts on having the readers understand the essence of continuous assessment in the context of inquiry, and the strategies and tools for collection, analysis, and use of continuous assessment data.

The quotations from teachers, teacher educators, and program staff work to enhance the descriptions and understanding of this type of formative assessment. Vignettes of teachers and students practicing inquiry and continuous assessment are included to give pictures of what it can look like in the classroom setting.

The resources we used in writing the book along with other resources we feel would be helpful to further your knowledge base on the themes discussed in the chapters are listed at the end of the book.

Chapter 1 describes the uniqueness of continuous assessment as a teaching and learning strategy as well as a strategy integral to your own professional development. You will read about the importance of using this type of formative assessment for the benefit of your students, and as information to share with parents and other stakeholders. You will see how it matches your goals for student learning, and how it also serves many other purposes, including your own reflection on and self-improvement in your teaching. A picture of how this type of assessment fits into the larger view of assessment is captured

## **xiv • Weaving Science Inquiry and Continuous Assessment**

in graphic form, and the techniques and tools of continuous assessment are introduced.

The chapter closes with a vignette of one teacher's classroom research around the questions he had about student conceptual development and his use of continuous assessment strategies and tools to help him find the answers he needed.

Chapter 2 anchors this type of assessment firmly in the context of inquiry-based learning. The chapter begins with a discussion of how trust in students and respect for their ideas form the underpinnings of inquiry learning and continuous assessment. A review of inquiry is given in writing and graphics, and the chapter continues with the idea of using continuous assessment within the context of inquiry. The vignette at the end gives a view of how both facilitating learning and continuously assessing become intertwined and at times indistinguishable from one another.

Chapter 3 provides more detail of each of the strategies and tools that can be used for facilitating and documenting the learning taking place in your classroom. Contexts, key elements, and implementation suggestions are given for each technique. Explanation of each of the documentation tools is included in the text, followed by a discussion of the advantages, and challenges of each tool. Voices from the field lend examples of actual classroom experiences to the discussion of each strategy and tool.

Chapter 4 makes the important point that what you do with the documentation is as important as your abilities to facilitate and collect it. This chapter discusses how to analyze and use continuous assessment data and reinforces the idea that knowing what you're looking for is key to being able to determine what and how the students are doing. Whether you're analyzing data on the spot during a class or listening to a tape on the way home from work, having in mind clear indicators of the skills, concepts, and dispositions necessary for scientific literacy is key. With these indicators in mind, you are able to use data to make decisions on the spot or for the next day, to take learning deeper, to enhance your own teaching skills, and to save pieces of data for summative reporting. Examples of all of these uses are provided, and a vignette at the end tells the story of how one teacher uses ongoing/continuous assessment throughout a unit on light.

Chapter 5 addresses the realities of implementing inquiry and continuous assessment in your classroom. Handling time challenges of inquiry and continuous assessment, integrating them with traditional testing, acquiring more content knowledge, managing continuous assessment, helping students engage deeply in their learning, resources, and parent involvement are addressed.

Chapter 6 describes ways in which continuous assessment data help teachers see ways to improve their own teaching practices of implementing inquiry and continuous assessment. This reflection and improvement is a kind

of ongoing professional development for the teacher by her- or himself and together with peers. Later in the chapter a model of professional development is described that features inquiry and continuous assessment.

The Resources at the end of the book contain easy-to-use charts of the techniques, tools, purposes, and uses of continuous assessment and National Science Education Standards summary charts for assessment, content, teaching, program, district, and professional development standards.

## HOW TO USE THE BOOK

Teachers can read the chapters and consider their own beliefs and practices for facilitating and assessing inquiry in science and other disciplines. Teachers in study groups can read, discuss, and try out ideas and strategies proposed in the book, and debrief their experiences and findings with their peers. Professional Developers and Teacher Leaders will find the book useful for their own understanding of inquiry and this type of formative classroom assessment as well as use the book with teachers in their courses and other professional development initiatives.

## ACKNOWLEDGMENTS

This book is the culmination of working for over a decade with elementary and middle school students, teachers, and administrators. In 1990 we created a network of schools and teachers dedicated to carrying out recommendations as published by the National Center for Improving Science Education. With inspiration and support from Susan Loucks-Horsley, Susan Mundry, Senta Raizen, and many others from The NETWORK, Inc., we were able to create The Vermont Elementary Science Project thanks to funding from the National Science Foundation. The years of providing professional development and sustained support in science education for teams of teachers and administrators led to The Continuous Assessment in Science Project, also funded by the National Science Foundation, in which we refined the strategies and engaged in inquiry around the ideas that are represented in this book.

Instrumental in all of these endeavors has been our Senior Advisor, Susan Mundry, and our Senior Scientist, Bob Prigo. Bob's talent and vision for the role of content in the science education change process have been invaluable. Susan's faith in our work; her knowledge of teaching and learning and of teacher development; and her help in organization, planning, and implementing our ideas has been inspiring. The educators who used continuous assessment as a driving force in their classrooms and in their own professional development remain key people to whom we are indebted. These include:

**xvi • Weaving Science Inquiry and Continuous Assessment**

A special thank-you to Graham Clarke and Pat Fitzsimmons for allowing us to use them as “case studies,” and to Mary Abele-Austin, Steve Bless, Grace Freeman, Sharyl Green, Cyndy Hall, JoAnn Harvey, Carol Hinsdale, Mary Ladabouche, Denise Larrabee, Susan Linskey, Kathy Renfrew, Kurt Sherman Carol Slesar, Lynn Talamini-Hervey, Ginny Yandow, Janice Brisco, Lisa Charpentier, Lauren Kogge, Linda Peake, JoAnne Smith, and the Charlotte Elementary School students, teachers, and administrators.

We sought guidance and support from many other professional development educators from around the country as we refined the process of shaping the ideas for this book. They include: Tim Whiteford, Page Keeley, Doris Ash, Edith Beatty, Becky Dyasi and Hubert Dyasi, Meredith Wade, Casey Murrow, Frank Watson, John Tapper, Mike Jabot, Susan Holmes, Christina Johnson, and Tre Burke.

We are also indebted to our friends at Learning Innovations/WestEd who have helped and supported us in numerous ways: Eve Pranis, Deanna Bailey, Cheryl LaFrance, Cybele Werts, Jan Phlegar, Dolly Fleming, and Jane Nesbitt.

Finally, we wish to thank our NSF program officer, Janice Earle, for her guidance and support.

Corwin Press gratefully acknowledges the contributions of the following reviewers:

Joan Commons  
Academic Coordinator  
UCSD Center for Research in Educational Equity,  
Assessment, and Teaching Excellence (CREATE)  
La Jolla, California

Douglas Llewellyn  
Visiting Professor  
St. John Fisher College  
Rochester, New York

Joani Harr  
Middle School Math Teacher  
Seattle School District  
Seattle, Washington

Nancy Kellogg  
Professional Development Coordinator  
Center for Learning and Teaching in the West  
Boulder, Colorado