



Foreword

Science teachers everywhere agree: Teaching science, no matter the level, is hard work! To do it well and to be effective requires continuous learning. Not only is the knowledge base that explains science phenomena continuing to increase, research findings that help us understand how students learn are also increasing. The goal for science teachers is to maintain a balance so that it is not about working harder trying to keep up with the new research-based findings, but about working together to implement the best practices in the classroom.

Designing Effective Science Instruction: What Works in Science Classrooms is designed to pull together recent findings from many science education studies and teacher education initiatives. It can be a daunting task for a teacher to learn about each initiative separately and then integrate the new learning within existing instructional frameworks, one initiative at a time. This book presents an instructional framework and includes the separate initiatives (i.e., addressing misconceptions, formative assessments, inquiry approaches) as part of a larger framework of effective science instruction. An individual teacher of science or groups of teachers can use *Designing Effective Science Instruction* to plan and implement changes to his or her science instruction.

Effective Science Instruction: What Does Research Tell Us? (BaniLower et al. 2008) summarizes the research foundation for this book. In this report, researchers shed light on possible reasons for poor student performance in science. Most notably, research revealed that in a national sample of science classrooms, science lessons do not often include the features identified as part of effective science instruction. In other words, too many science students are not clear about the learning goal being taught, and they are not being asked to make sense of the content that the teachers deliver. Students cannot, because of this classroom culture and instruction, understand and retain the science concepts they are supposedly learning. If the students are learning, the learning is frequently temporary and often as a response to a quiz or test. The study further indicated that teachers of science are too often unaware of the research that identifies the effective practices they need to implement in their science classrooms.

For the past several years I have worked with teachers of science as they designed and redesigned their lesson plans, examined their craft, and attempted to implement change in their classrooms. The result was often ineffective, with little or no change to the science teachers' overall practice. The reason for this lack of change was simple: Limited information was available to me about effective teaching and I had to turn to a myriad of research articles that had little impact on the teachers themselves. This book will change all that by bridging the gap between research and practice.

The book begins by providing examples of effective strategies that support the development and delivery of science lessons that foster student understanding of the science concepts being taught. It targets one key element found in the (Weiss et al. 2003) research into designing effective lesson plans. The book dives into the characteristics of effective lesson plans, asks teachers to reflect on their current lessons, and then provides strategies for redesigning those lesson plans into even more effective lessons—ones that embody the characteristics of high-quality lessons from the research.

Using the Content-Understanding-Environment (C-U-E) method, this book gives teachers the tools to approach lesson planning with confidence. Teachers will be able to pinpoint aspects of their instructional practice that need improvement. They will understand how to seek out the content knowledge and experiences they need to become more effective science teachers. They will be able to implement changes to their teaching craft, to become effective facilitators of student learning, and to provide their students with rich and active learning environments that allow for successful student achievement.

I know teachers of science will find this book helpful, valuable, and informative. The book will assist as they evaluate science instructional practices, reflect on that practice, and make changes to improve that practice—the hallmarks of being effective science teachers. *Designing Effective Science Instruction* embodies this. Let the journey begin.

—Shelley Lee

References

- Banilower, E., K. Cohen, J. Pasley, and I. Weiss. 2008. *Effective science instruction: What does research tell us?* Portsmouth, NH: RMC Research Corporation, Center on Instruction.
- Weiss, I., J. Pasley, S. Smith, E. Banilower, and D. Heck. 2003. *Looking inside the classroom: A study of K–12 mathematics and science education in the United States.* Chapel Hill, NC: Horizon Research, Inc.