Introduction

THE PURPOSE OF THIS BOOK

In today's K–8 general education classrooms, teachers are aware of students who have been mainstreamed into their classes. Most are also aware that there are resource and special education teachers available to help them with these students and their Individualized Education Plans (IEPs). Unfortunately, most teachers are also aware that the amount of resource help they can actually get is limited due to the demands placed on resource teachers from the rest of the faculty and staff. So, much rests on the shoulders of general education teachers with respect to developing and delivering instruction that meets the needs of their students who have special needs. The purpose of this book is to provide some suggestions, guidelines, and examples of things teachers can do to make science activities and assessments more accessible to their students with special needs. Indeed, as the authors found in the years of pilot testing these guidelines, even gifted students have said the changes made things clearer for them. Teachers have also found these ideas to be of help in addressing issues of universal design and Response to Intervention (RTI).

This book is for general K–8 elementary teachers who teach science, and for their special education colleagues who wish to work with them to improve instruction in the classroom. With this in mind, the ideas in a book such as this cannot, nor should they, replace IEPs or innovations like RTI. However, teachers can have more ownership in the ways they prepare for helping their students learn science, and be more effective doing it. There is considerable value in general education teachers learning more specifics about the needs and characteristics of their students having special needs, and there is concurrently considerable value in special education teachers learning more about science and science instruction. Working together, both can be a dynamic pair having positive impact on the students in their charge. All that being said, it is important teachers clearly understand that even though the bulk of this book focuses on attending to the materials (written and otherwise) used in science teaching, the ultimate focus is to make science instruction more student centered and to use revised materials as one of the tools to enable effective inquiry learning to take place.

RATIONALE FOR THIS BOOK

The basic premise behind the design of this book is that in today's schools, most students with special needs are taught in inclusion classrooms. One of the challenges related to inclusion is preparing educators to teach science education with activities, laboratories, and assessments that are appropriately designed for students with exceptional education needs. As designed, most standard science activities and assessments fail to accommodate for the difficulties encountered by students with learning disabilities, behavioral disorders, and other special characteristics. In many states, such issues have come to the forefront as school improvement plans have been designed and implemented, requiring all schools to assess all students' learning at specified grade levels. The need to do so has been further underscored by the effects of the No Child Left Behind Act (NCLB) passed by Congress. It is no surprise to educators that students who are not appropriately and actively engaged in learning science will likely fare poorly on science assessments. The National Research Council (NRC) has addressed the importance of high-quality science activities and assessments in its *National Science Education Standards* (1996). This document describes assessment as necessary for providing teachers the information required to plan and conduct teaching in appropriate ways. Assessment data guide teachers by providing knowledge about student progress and understanding. Further, assessment tasks must not be afterthoughts, but must be

explicitly designed into the teaching process. The effective science teacher uses care in the selection and design of both classroom activities and assessments, and uses assessment tasks that are at the same time positive learning experiences for students.

LIMITATIONS OF THIS BOOK

As noted earlier, this book is intended for Grades K–8 general and special education classroom teachers, and contains outlines of strategies, or guidelines, useful in "retooling" traditional science activities and assessments so that they are more appropriate for students with special needs who are mainstreamed into general education classrooms. At the same time, the activities and assessments must be appropriate for the "typically achieving" student. Considering the variety of disabilities extant in the student population and space constraints, only two disabilities have been addressed in these retooling guidelines: learning disabilities and behavioral disorders. For similar reasons, the guidelines described in this book were developed specifically for science activities and assessments for Grades K–8. Although many of the guidelines have some applicability to other grade levels, and perhaps to other student disabilities, the reader should be aware of the original target audience for the guidelines. The ideas included in them have been teacher developed and teacher tested in actual classroom settings.

This book does not attempt to address or describe the myriad examples of settings and circumstances possibly encountered in inclusion classrooms, nor does it attempt to outline general classroom and behavior management strategies. The materials contained in this book focus exclusively on how to revise science activities and assessments and then use them.

BASIC REMINDERS

The process of developing these guidelines rested on several premises, discussed briefly as follows. They provide the context in which this book should be read and used.

1. Guidelines must be developed and used by K–8 general and special education teachers working as co-teachers in inclusion classrooms. Each teacher must have equal opportunities for input, each must respect and value the other's contributions, and each must be willing to help the other learn about their special knowledge (i.e., general classroom teachers need to learn more about specifics of special education, and special education teachers need to learn about specifics peculiar to science teaching). Hence, teachers can enhance success with their revising endeavors by working collaboratively as teams, having equal responsibilities, and sharing in the outcomes (sometimes including the actual teaching).

2. Retooled science activities and assessments must remain suitable for general education students. An aim here is for the teacher not to create activities useful only to one segment of the student population. This would simply shift the problem as it presently exists from one side of the coin to the other. Such efforts are untenable, particularly considering the time and effort teachers would invest in the process or in revising science activities and assessments.

3. When making modifications to activities and assessments, teachers should *not* lower their expectations of what students can do or learn from the activity. Expectations should remain high. The revised activities and assessments should contain changes that make them more readily usable for students possessing learning disabilities and behavioral disorders.

4. Revised activities and assessments for students with special needs should not be viewed as being lower-grade level activities and assessments. Because many students with learning disabilities and behavioral disorders are quite intelligent, providing them "easier" or lower-grade level activities and assessments is not an appropriate strategy. Such students need to be actively engaged in challenging and interesting learning activities and assessment tasks.

Finally, as with most useful tools, the guidelines in this book may need to be adjusted, added to, deleted from, and so on as time passes. This is necessary if such a tool is to remain vibrant and in touch with the reality in today's schools and classrooms.

SUMMARY OF CHAPTER CONTENT

Although some K–8 science teachers may be prepared to deal with any special education situation that confronts them in their classrooms, many are not. Hence, it becomes important for teachers to have some knowledge of what resources are available to help them when the need arises. One such resource can be found in colleagues down the hall: the special education teachers. Chapter 1 takes a look at the importance, in fact—necessity—of science teachers collaborating with special education teachers to provide appropriate instruction for students having special needs. The chapter then moves into looking at what some of those special needs are, and provides a short description of the most common ones that are found in mainstreamed classrooms.

In Chapter 2, the theme from Chapter 1 continues with considerations science teachers should make when planning science instruction. Characteristics of learners with special needs are noted, along with some suggestions teachers may follow in dealing with these characteristics. Such characteristics include writing difficulties, reading difficulties, language processing difficulties, attention deficits, perceptual and spatial orientation deficits, impulsivity problems, and memory deficiencies. In addition, some motivational strategies are explored that can help teachers get their students moving in the desired direction with respect to learning in science. Finally, most science teachers recognize that science (indeed, the English language) is replete with words that mean different things in different contexts, even though the words are spelled and pronounced the same. What are some problem words that might affect students? Chapter 2 provides a list to help teachers get started in their thinking on this issue.

Colleagues who have reviewed this book have noted that its heart begins in Chapter 3. In this chapter, specific suggestions guide teachers in preparing for differentiated science instruction, beginning with identifying specific competencies to be targeted, moving to vocabulary and prerequisite skills, and then looking at things that can be done to improve written and printed materials and verbal directions.

Building on the suggestions in Chapter 3, some actual examples of science activities and how they can be revised using the guidelines appear in Chapter 4. Specific examples ranging from primary to middle school are provided, as are examples from biological, earth, and physical sciences. The annotated activity examples include specific notes about what revisions can be made, along with some rationales for making those changes.

Similar to Chapter 4, Chapter 5 assists the teacher with how to revise science assessments. Included in the chapter is a middle-grade traditional assessment and an example of how such an assessment can be revised using the guidelines from Chapter 3. Also in this chapter are some performance-based assessment samples, spanning primary through middle-school levels. As in Chapter 4, there are annotated examples that include specific notations regarding what revisions have been made and some rationales for them.

Chapter 6 provides a brief examination of assessment rubrics, including a discussion of types of rubrics and general suggestions for starting to make them. After these rubric basics are covered, teachers are provided a sample performance-based assessment, its rubric, and two student work samples for the assessment. Teachers are guided in using the rubric to score the work samples, and then the scores are discussed with respect to what is assessment and what is evaluation. The chapter concludes with some consideration of what a teacher can do to differentiate science instruction in an appropriate way based upon the results of the assessment for one of the students.

Finally, the Resource section helps place the differentiation of science instruction in the context of the national science education standards promulgated through the NRC (*National Science Education Standards,* 1996), the American Association for the Advancement of Science (*Benchmarks for Scientific Literacy,* 1993), the National Science Teachers Association's documents on scientific literacy, scope-sequence-coordination, and pathways to scientifically literate and inquiry-based instruction. The chapter concludes with mention of state science learning standards. Overall, the themes that emerge from these various standards documents are that science instruction should be inquiry based, and it should be for all students—including those with special education needs.

SOME HELPFUL RESOURCES

Institute of Education Sciences, U.S. Department of Education. (2007). *Fast facts.* Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=59. The National Center for Education Statistics (NCES) is the primary federal entity for collecting and analyzing data related to education.

National Research Council. (1996). *National science education standards.* Washington, DC: National Academy of Sciences. This is the primary science education standards source used by the science education community.

U.S. Department of Education. (n.d.). *Building the legacy: IDEA 2004.* Retrieved from http://idea.ed.gov. This site was created to provide a "one-stop shop" for resources related to IDEA and its implementing regulations.