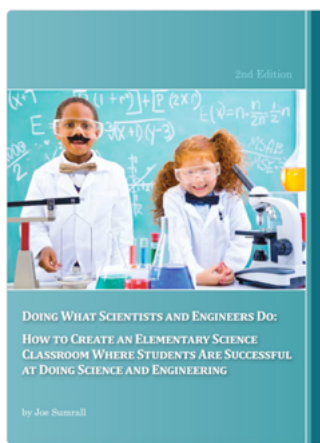


STEM Teacher Education Textbook Review: Facilitating Understanding of How to Teach Science in K-12 Doing What Scientists and Engineers Do: How to Create an Elementary Science Classroom Where Students Are Successful At Doing Science And Engineering by William J. Sumrall

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The Journal of STEM Education: Innovations and Research, has a broad mission to inform STEM professionalism and education generally and specifically seeks to “promote high-quality undergraduate education in science” (<http://www.jstem.org/index.php?journal=JSTEM>). In light of this core mission, we review an undergraduate science teacher education textbook to inform science educators of this standards- and research-aligned book.



In “Doing What Scientists and Engineers Do...” (published by Sententia, 2017) author William J. Sumrall, a professor of science education at The University of Mississippi, “actively involves pre-service teaching candidates in thinking like and doing what scientists

and engineers do in the work place... by modeling the practices of scientists and engineers.” The ebook “is built within the frameworks of developing the skills necessary for elementary students to do science and engineering type activities...”

In “Doing What Scientists and Engineers Do...”, Sumrall creates experiences that support science as inquiry, leading pre-service teachers through practices that are foundational as leading scientific organizations promote. The goals of organizations such as the American Association for the Advancement of Science (AAAS), National Science Teachers Association (NSTA) and the authors of the Next Generation Science Standards (NGSS) are supported by new teachers gaining an understanding of the work of scientists and engineers. The text develops an understanding sufficient for implementation of inquiry in elementary classrooms, which will serve to develop a scientifically knowledgeable public and workforce, a goal of all of these associations

(see Eagan, et al, 2013). This book is aligned with international goals for facilitating inquiry-based science and increasing the quality of science instruction, an important step in improving the quality of science education and the country's role in a global society (Erduran, Sibel, Zoubeida, & Dagher, 2014).

At a time when science and engineering are being limited in elementary schools, Sumrall illustrates that it is possible to teach science in ways that cultivate the classroom experiences and maximize student achievement. The key to creating activities for the students to be successful learners is to model the practices scientists and engineers do. Sumrall identifies the foundation of effective modeling through observing, measuring, and experimenting. The book outlines an effective way to foster student success by outlining strategies for resourceful processes, promoting learning experiences through problem based learning, and preparing diversity integration. This book includes model lesson activities that advance the objectives of Next Generation Science Standards (NGSS), while pinpointing instruction through literature connections and National Science Teachers Association (NSTA) published articles.

The book is structured to scaffold undergraduate education students understanding of the multiple facets involved in teaching and learning science by providing the research-based rationale for science processes and the corresponding application that occurs in classrooms:

1. Getting Started- what happens during the first days of this elementary science methods course? And, how should you prepare to teach science and engineering? *For teacher education students, who are emergent in their knowledge of science education, they learn what the research advocates for how to facilitate science learning in K-8 in three sections. The sections address how to manage cooperative learning, how to design your own science instruments and how to engage students in activities and experiments.*
2. Scientists Are Observers-*Through several observation activities, students learn how to teach observation skills and promote science literacy in elementary children.*

3. Scientists Are Classifiers-*Activities involve classifying using various scientific protocols but also inventing your own system based upon patterns collecting and organizing leaf collections.*
4. Scientists Are Measurers-*Among the many activities in this section, the reader measures “structural” strength of a tower to weigh safety versus cost in a simulation examining how we as a society deliberate over safety versus cost in structures such as bridges and buildings.*
5. Scientists Are Experimenters-*The reader is led through the scientific process and the school science fair model is leveraged here to promote student conducting of experiments all throughout the year.*
6. Engineers Are Problem Solvers-*Influenced by Problem-based Learning, this section demonstrates and prompts the reader to design problems that promote cooperative problem solving by the students.*
7. The Invention Process and Quality Control-*The reader will learn how to promote creative and enterprising science discovery through activities that call for methods of scientifically examining the quality of a particular design.*
8. The What and Why of Science and Engineering-*In all of the United Kingdom and in Canada there exists national standards for engineering design for students K-12. Lacking these standards (and the existence of goals and curriculum as well) in the United States, this section promotes scientific design and an understanding of engineering as a way to solve problems.*

As higher educators who teach undergraduate science methods, we recommend this book as an invaluable tool to not only promote an understanding of science education for education majors but a way that prompts students to actively “do” the science so that they in turn can facilitate science learning in K-8 classrooms as teachers.

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Michael Mott is Associate Professor of Teacher Education at The University of Mississippi. He earned his Ph.D. in Curriculum and Instruction from Mississippi State University and a Masters of Science in Education from Bank Street College of Education. Dr. Mott has authored 11 books and two book chapters published by Pearson, Cognella, TouchSmart, IGI Global and Information Science Publishing. Dr. Mott's research in assessment has been funded via large-scale federal programs, and state and locally supported projects (\$618,000.00 as PI). Write-ups of this research led to 21 peer reviewed publications. Previous to higher education Dr. Mott worked in science education with the Chicago Public Schools, as a reading specialist in Suburban Chicago and as a New York City Public School teacher.



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