

## Chapter 1

# **International Perspectives on Science Teacher Education**

## *An Introduction*

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Science education has seen its share of reform efforts come and go. For the most part, these reforms have centered around changes in science curriculum and instruction. We are now in the midst of yet another wave of reform, this one sparked by the publication of science standards in several countries. This time, however, the reform efforts are attending to a feature of reform that has often been forgotten: science teacher education. Reformers have realized that new curriculum or innovative instructional techniques need teachers to carry them out. Thus focusing on reform in science teacher education will be crucial to the success of other science education reforms.

The authors of the pieces in this volume have witnessed their share of reform efforts in their countries, some driven by government policies, some by institutional initiatives, and others by the researchers themselves. Collectively the writers paint a promising picture of science education internationally. Their picture is one of change and progress, of commitment and hope. Their stories are presented in the spirit of capturing history and moving forward to inform the future.

## **OVERVIEW**

The opening section of this volume, “Policy and Practice in International Science Teacher Education,” takes us to four different nations to examine the development of teacher education and the directions for the future. Appleton, Ginns, and Watters discuss elementary science teacher education

in Australia, which has moved from a one year program to a four or five year qualification. Borghi, De Ambrosis, and Mascheretti illustrate the reform in science teacher education in Italy with the case of physics teacher education. They challenge teacher preparation programs to provide a wide range of coursework in education, science, and the history and nature of science to engage students in the most current views of best practice. BouJaoude details science teacher education in a variety of higher education institutions in Lebanon and provides a set of recommendations for the future based on the strengths and weaknesses of these programs. Iqbal and Mahmood summarize the science teacher education situation in Pakistan, providing recommendations for higher education to work with teacher inservice agencies to educate future science teachers. The issues that these authors discuss, although specific to their own national contexts, are by no means unique. Their solutions have the promise of informing other nations in the midst of science teacher education reform.

The next section, "Making Sense of Science Teacher Learning," highlights research on student learning in teacher preparation programs. Weinberger and Zohar discuss the use of a curriculum designed to improve higher order thinking skills in a junior high teacher preparation program in Israel. Their study demonstrates that preservice teachers can learn how to develop higher order thinking in their students as a result of developing their own thinking skills. Baird, Brodie, Bevins, and Christol examine the student teaching experience of secondary science teachers in the United States and the United Kingdom. Their work has led to the creation of a model for the student teaching experience. Abell and Jacks tell the story of one student, early in her elementary teacher education program, and how she learned to think like a teacher while participating in a Study Abroad internship in Honduras. These authors are generating knowledge about science teacher education that can inform reform efforts globally.

The final section, "Cross-cultural Perspectives on Science Teacher Education," reports on several international partnerships that are generating new knowledge about science teacher education. Koch and Calabrese Barton tell the stories of Egyptian teachers engaged in a US teacher enhancement project. Their stories help us understand the cross-cultural issues that come into play when instructors and administrators work with teachers from different countries. Pedersen, Bonstetter, Rioseco, Briceno-Valero, O'Callaghan, and Garcia discuss the political and cultural climate for change in Chile, Bolivia, and Venezuela, and how partnerships with higher education institutions in the US have contributed to science teacher education reform in these countries. The book ends with a chapter by Tippins, Nichols, and Bryan, in which they present the voices of their international colleagues—Amadou, Chun, Ikeda, McKinley, Parker, and

Herrera-- in an attempt to understand scientific literacy and science teacher education from a global perspective.

## THEMES

What I have learned from these stories is that the problems faced in science education in a given country, although unique to its history, politics, and culture, also share commonalities with other places. Furthermore, the solutions to these problems, both envisioned and enacted, reveal common themes in our science teacher education work. I would like to explore some of these themes briefly, before setting you off on your own journey through these stories.

Not surprisingly, no place has “arrived” at the pinnacle of science education. The authors, whether from developed or developing countries, describe situations where science education and science teacher preparation are less than adequate for the science literacy goals embraced by governments, citizens, and educators. In many countries, a portion of school-aged children receive little or no science education—because they do not attend schools; because the schools they do attend are lacking in resources, including prepared teachers; or because their language and cultural background exclude them from school science. In many places worldwide, science educators and government officials have recognized the weaknesses in their systems and are making strides to ameliorate the problems.

One science education reform strategy that is clearly at the top of the list, again in both developed and developing countries, is to restructure science teacher education. The authors in this volume agree that it takes time to learn to be a teacher. They agree that teachers must understand science concepts, principles, and the nature of science; how students learn; and science curriculum, instruction, and assessment. They agree that teachers need time in the field, working with students and reflecting on practice. They recognize that teachers are the key to reform and that improved teacher education is an essential feature of successful reform. The other day I heard a radio commentator suggest that, to improve schools in the US, we should close all faculties of education, stop preparing teachers per se, and ask students with bachelor’s degrees in any field to teach our children. As a teacher educator, I was appalled by the simplemindedness of this proposal and angered by the lack of understanding of teacher education and the profession of teaching. Many of the initiatives described in this book have the potential to make a real difference in science education around the world.

I challenge all of us who care about schools to create and enact policies and practices aimed at challenging business as usual and changing the status quo.

We should not expect these changes to take place quickly. The success of the reforms will depend not only on the quality of the education program offered, but also on the political, economic, and cultural climates in which they take place. The American Association for the Advancement of Science (1993) was farsighted to recognize that deep and lasting change takes time, and that the year 2061 is a realistic timeline to achieve the science education reforms initiated in the latter part of the 20<sup>th</sup> century in the US. In other places, however, reform measures may last only as long as the current political regime. What this means for science teacher educators is that we must be forever vigilant, looking for the best opportunities to take action and have an effect. And although we must think globally about the issues and values in science education, we must act locally to affect our particular contexts.

This book is an attempt to highlight some themes in science education reform and describe various efforts to improve science teacher education around the globe. I advise the reader to search for your own connections to the policies, practices, investigations, and stories presented here, and then use them to take action on your own situation. We can understand our own situations better by understanding the situations of others. Collectively we can then continue to change the global landscape of science teacher education.

## REFERENCES

American Association for the Advancement of Science. (1993). *Project 2061: Benchmarks for science literacy*. New York: Oxford University Press.



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