CHAPTER 1

SCIENCE EDUCATION:
WHAT DEFINES A FIELD OF RESEARCH?

Coming from nuclear physics, the paper by Gilbert and Watts (1983) fascinated me because I found it a very balanced opening of attention on a new field, which may have many promises in itself, and which may be comparable to the development of science in history.

Gerard Thijs, The Netherlands

QUESTION IDENTITY

In this chapter I begin to address a basic question that underlies my first perspective about the identity of science research: In what senses is science education a field of research? So much research about science education has been done in the last forty years and is now in accessible literature, and so much more is in process, that it is an appropriate and interesting way to consider what has been achieved.

A parallel question was asked a decade ago in relation to research in mathematics information, and a quite elaborate study, What is research in mathematics education? and What are its results?, was launched by the International Commission on Mathematical Instruction, ICMI. Mogens Niss, the Secretary of ICMI, established a Program Committee for the study and this group collaborated in 1992 to produce a Discussion Document describing the reasons for the study and laying out the following questions to be addressed.

• What is the specific object of study in mathematics education?
• What are the aims of research in mathematics education?
• What are the specific research questions or problematiques of research in mathematics education?
• What are the results of research in mathematics education? and
• What criteria should be used to evaluate the results of research in mathematics education?

The Document was followed by a Study Conference in Maryland, USA, in May 1994 when, despite the quite different responses that were given to these questions, the participants agreed that together ‘they still constitute a (research) community and that it is necessary to search for what constitutes its identity’ (p. xi, Sierpinska and Kilpatrick, 1998).

This search was taken a step further when the book, Mathematics Education as a Research Domain: A search for identity, edited by
Sierpinska and Kilpatrick, was published in 1998. This volume is not the proceedings of the Conference although many of its authors, internationally leading mathematicians and researchers, were present. The views of these authors were so diverse, and the issues they address so sectional, that it was not possible to organize the book under the five questions above. Rather it is organized in six parts that group together papers that related more or less to each other in focus or ranging response to the whole issue of this study.

In my approach to the similar question I am asking about research in science education, the criteria I set up to provide answers are more specific than the five above, although there is some overlap and the very similar intention of searching for identity. Because the answers to the question for science education research that I provide in this book are by me as a single author, albeit informed and expressed by almost 80 research colleagues, I was able to strive for a coherence that was not possible for Sierpinska and Kilpatrick, as editors, of such a variety of chapters from thirty two authors.

This is not to claim that there is, in practice, more coherence in the science education community, and its lack will often be evident in later chapters. Nevertheless, that this community is also searching for its identity is evident from the paper by Dahnke et al. (2001) that is referred to in some detail towards the end of the chapter. It arose from a group at the second ESERA Conference in 1999, who were concerned with the comparison between the considerable authority that the research communities in the sciences have in comparison with the authority of the science education one. I also have chosen to use comparison with the research communities in the sciences in this chapter to set up a number of criteria for assessing the state of science education as a research field or, in other words, for revealing some details of its identity.

**ALTERNATIVES TO IDENTITY**

However, to begin, it will be as well to see how all this now considerable body of research might be viewed if some of the answers to the basic question above turn out to be negative. In that case, the research could perhaps be assigned as a sub-field within a larger field, for example, educational research. It is, however, commonly argued that educational research, in its entirety is far too diffuse and disparate in its interests to warrant the identity of a field. In that case, the various studies in science education could be apportioned to a range of other established research fields like history, psychology, sociology or philosophy depending on the questions being asked, the explicit or implicit theoretical stance that is taken, and the methodologies that are employed. It is certainly true that, over the years and still, there are researchers from these and other disciplines, who have studied the situations in which science education is occurring. They would not identify themselves at all as science educators. This is very evident in the currently fashionable area of