4. THE CARD EXCHANGE: INTRODUCING THE PHILOSOPHY OF SCIENCE

The nature of science is an important though difficult subject to teach meaningfully and effectively to preservice teachers. To engage the students’ minds in this subject that many find obscure and esoteric, a good introduction is a necessity. This chapter presents a learning game called *The Card Exchange* which has been found effective in arousing student interest in the philosophy of science. The chapter presents a brief description of how the game is set up and played and how it relates to the authors’ instruction on the philosophy of science. The chapter includes a list of card statements. The statements as well as the text of the chapter have been revised and updated from an earlier publication (Cobern, 1991a).

There are a number of thoughtful articles in the literature stressing the need for philosophically literate teachers of science at all school levels (e.g., Andersen, Harty & Samuel, 1986; Hodson, 1985; Martin, 1979) and for many years the textbooks used in science methods courses have contained at least some material on the philosophy and nature of science. Nevertheless, science educators have been concerned that an acceptable level of philosophical sophistication was not being reached within the ranks of science teachers, and consequently are concerned about views toward the nature of science promoted in the classroom (e.g., Schmansky & Kyle, 1986). Duschl (1988, p. 51) summarizes the classroom situation by saying that “the prevailing view of the nature of science in our classrooms reflects an authoritarian view; a view in which scientific knowledge is presented as absolute truth and as a final form.” This view has been called scientism. This is a problem first because as we learn more about the world views that students bring to the classroom we begin to understand how the scientistic view extinguishes students nascent interest in science (Cobern, 1991b; 1996). Secondly, those students who do accept the scientistic view are likely to become disenchanted with science at a later date as science fails to achieve the unrealistic expectations accompanying a scientism orientation. The challenge is how to teach the philosophy of science be taught to teachers with greater effectiveness?

**THE CARD EXCHANGE**

Sometime early each year in many schools, lessons are taught addressing the nature of science. Often instruction in the process of science is nothing more than a method
listed on the board and provided as the way all scientists work. Or it may be suggested that students will be following various aspects of this method in numerous activities throughout the year. Students are told, therefore, they will be doing real science. We take the view that students’ understanding of a) what science is, b) just how human the endeavor really is and --perhaps equally important -- c) what science is not, can be enriched and made more engaging by showing that those who do science, and those who write about it, hold varying views as to just what is authentic science (Martin, Kass, and Brouwer, 1990). If we can find ways to determine what individual students currently think, we at least can acknowledge their varying views--whether they come from ignorance, first impressions, or an extensive knowledge base about science. If necessary, teachers can then try to help them construct meanings more in line with a balanced view of science. Our purpose in this chapter is to present an activity, a learning game, which acts as a powerful set induction for subsequent instruction in the philosophy of science. We have found that this activity engages our students’ minds and precipitates enthusiastic discussion on the question, “what is science all about?”

We have used the game successfully in a variety of settings. Elementary and secondary preservice methods classes are one example. Here we found our challenge to be how much time we can spend on the nature of science versus all the pedagogical and content issues one must deal with for a variety of science disciplines and a variety of grades preservice students will teach. We found that if students have only one science methods class, it is difficult to find the necessary time to do a good job with nature of science issues. It is always the struggle between our desire to give them the necessary background and their desire to know “what can I do in my classroom tomorrow.” The card game does, however, serve as a highly effective entry into a world many students do not know exists.

Another group with whom we have used the card game are veteran classroom teachers, either during summer workshops or at state science teacher meetings in workshop settings. They love the activity, the engagement and, for many, the discovery that there is a whole area about science for which they have not had much background or experience. “Light bulbs” often go on in these settings and some teachers crave more. We both have had, from time to time, this activity result in teachers later enrolling in our graduate courses which concentrate on the nature of science and science teaching. There is little indication that most teachers who have become familiar with this strategy use the cards immediately with their students, although the high school teachers were more likely to see this as a possibility for their students in tenth to twelfth grade. Instead, it appeared that they were seeing this as a self-enriching experience that might enable them to teach from a different perspective.

When graduate students in science education play the card game, they are potentially the best prepared to get the most out of this activity. These students tend to have good backgrounds in science, have taught for a number of years, and have