One goal of science education reforms has been to improve approaches to learning that not only teach specific concepts but provide students with life-long problem solving skills (AAAS 1989; NRC 1996). Attaining this goal involves having students who are active participants in project-based classroom activities (Krajcik et al. 1994), rather than passive recipients of teacher disseminated knowledge. When students are provided a realistic context within which to solve problems and construct knowledge, learning is enhanced (Abrams 1998; Mullis & Jenkins 1988).

Student/Scientist Partnerships (SSPs) are a type of project-based instruction, wherein students are active participants in a scientific research collaboration between students, teachers and research scientists (Barstow 1997; Tinker 1997; Lawless & Rock 1998). SSPs provide context-rich, integrated, hands-on approaches to teaching the scientific enterprise as well as subject-specific content to K-12 students (Barstow 1997; Tinker 1997). They also provide the potential for scientific data collection from a broad geographical range that would not be feasible without such partnerships (Berkowitz 1997). To optimize the outcomes of both of these objectives, critical program components must be in place and the trade-offs between educational activities and accurate data collection for research must be clearly delineated. In this article, we draw on our experience with an established SSP, the Forest Watch (FW) program, to describe several critical components of these partnerships. We hope this guide will be useful for interested teachers considering participation in an SSP. We also present the trade-offs between educational and scientific objectives that must be made explicit by SSP administrators so that these partnerships can be successful from the point-of-view of both educators and scientists. This information is derived from several years of classroom observations, individual discussions with teachers and students, interviews with program scientists, responses to teacher surveys, and feedback from participating teachers at a recent FW workshop.

Throughout the article we use examples from the FW program to support and clarify some of the points we make. An overview of the program will help readers put the upcoming examples in context. The program, initiated in 1992, involves students from more than 100 schools across New England collecting annual data on the growth and health of five permanently tagged white pine trees in marked study plots near their schools. White pine is considered to be a bioindicator species because it is more sensitive to ozone exposure than some other tree species (Treshow 1986; Treshow & Anderson 1991; Theisen et al. 1994). Forest Watch scientists are testing the hypothesis that tropospheric ozone concentrations correlate with white pine needle damage and, eventually, growth. Students describe their forest site, make tree measurements, collect needle samples to analyze in the lab, and send to the University of New Hampshire (UNH) for spectral analysis. In the classroom, students measure needle retention and needle length, and quantify needle damage, looking specifically for symptoms of ozone pollution. Forest Watch materials also include protocols for making and examining needle-thin sections and doing an acetone-based chlorophyll extraction. Each year UNH compiles a data book containing all schools’ measurements, UNH measured spectra, and some analysis of data using student measures from all over New England.

### Critical Components of Successful SSPs

#### Access to Experts

Just as no one in the scientific research community works in a vacuum, teachers and students should not be expected to carry out SSP activities without access to someone with whom to discuss questions and concerns. Additionally, the scientists involved...