GETTING SPACE SCIENCE INTO THE K-12 CURRICULUM. S. K. Croft[1], AND S. M. Pompea[1]. [1]NOAO, 950 N. Cherry Ave, Tucson, AZ 85719. scroft@noao.edu, spompea@noao.edu.

Introduction: the Problem. One of the major challenges facing scientists and EPO specialists connected with major projects and missions in astronomy and the space science is disseminating their high quality materials widely into K-12 classrooms. School science curricula are already crowded with necessary and worthy educational content – much of it mandated by state or national science content standards. Consequently, most teachers have no time in the school year to insert new "extra" materials, even if they are motivated to use your new mission results through participation in a workshop or by reading some of your posters or print materials. In the five years since the enactment of the No Child Left Behind law, the opportunities to use new mission materials have become fewer as K-12 schools across the nation have narrowed their curricula still further to "teach to the test." Civics, history, geography and creative writing are being pushed out, and even with science becoming part of the state tests this year, the curriculum generally does not include much earth or planetary science.

One Successful Solution. One successful approach is to find content areas in the existing curriculum that can be taught in a more engaging way by using data from your mission. The first step is to lay out the science objectives of your project/mission, both the cutting-edge work that is the focus of your research, and the basic concepts that the research is based on. Remember that your specific research topic, however exciting and fundamental it seems to you, usually does not translate directly into K-12 settings. Second, carefully read through state and national science content standards to look for a match. It is also helpful to look at currently used textbooks in the subject area (usually physics, chemistry, astronomy, geology, and earth science) to look for specific basic concepts or sets of concepts that can be taught using your data and (perhaps) your methods. It is then imperative to talk with teachers currently active in the classroom to learn what they are actually teaching, what the students are interested in and capable of, and what types of activities would work in the classroom. Only then it is time to begin writing the alpha version of the materials that will be used in initial classroom testing. As the materials are developed further, active teachers should be involved in every step to ensure what you develop is useful and can find a place in the curriculum.

This approach has proven successful in a number of EPO projects. We are currently using it again in the design of an EPO program for a major new astronomy project, the Large Synoptic Survey Telescope (LSST). We had three major "institutional" objectives: 1) make data/science objectives from the new instrument useable in the classroom, 2) reach a large audience, and 3) develop a new project that furthered the ongoing efforts here at the National Optical Astronomy Observatory to get real research into the classroom. The major scientific goals of LSST are to map the universe in three dimensions to constrain the nature of dark matter and dark energy, and to do an inventory of the solar system with emphasis on finding Near Earth Objects. In the national standards, topics on stars, galaxies and the universe (dark matter and energy) are covered in high school – principally in physics and the occasional astronomy class, while solar system topics are covered in middle school – mainly in earth science classes. As an organization, we were interested in developing research projects for middle school, so we quickly focused on NEOs and middle school. As it turned out, there were already numerous asteroid projects already in existence for high school (and a few for middle school), mostly concentrating on asteroid discovery. Opportunities for discovery, however, were being significantly reduced for amateurs because of active search programs already in operation or coming online in the near future, so we looked at characterization of asteroids as an alternative approach. That turned out to be an appropriate entry point for asteroids into the middle school curriculum: earth science is taught at nearly every middle school in America (a large audience). Important earth science concepts in the national science content standards include how the Earth and solar system formed, types of rocks, processes by which rocks form, natural resources, and natural hazards. Asteroid characterization addresses the types of asteroids, what they are made of, where they are in the solar system and how they got there, and how they might impact Earth. Asteroid types and evolutionary processes can be tied to Earth rock types and processes through meteorites (in a broad sense, recognizing the difficulties) which exhibit typical Earth processes such as melting, differentiation, and even interaction with liquid water.

We then took this idea and discussed it with middle school teachers in focused discussion, small workshops, and presentation at meetings where teachers would be present. We identified a small group of teachers who would review and test our materials in their classrooms. We are now at the stage of writing our alpha materials to be tested in classrooms this spring and summer. Stop by our poster to discuss progress on our project and ways of getting your science into the curriculum.