

LESSONS LEARNED FROM THE MARS STUDENT IMAGING PROJECT: ELEMENTS FOR SUCCESS IN CREATING AN AUTHENTIC RESEARCH EXPERIENCE FOR K-12 STUDENTS

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Introduction: The Mars Student Imaging Project (MSIP) is inquiry-based and student-centered allowing students to create and investigate their own research question about the Martian surface. We have seen the impact of connecting working scientists and professional outreach educators with teachers and students. Teachers are empowered to engage students in the process of real science by replacing worksheets with the collection and analysis of real data from the students' own, targeted images of Mars. This process lays the foundation for follow-on learning, as students understand how science really works by actually *being* a scientist [1,2,3,4].

MSIP is an immersive and transformational way [1,3] for students in grades 5 through early college to engage in the scientific practices as articulated in the Next Generation Science Standards through authentic research experiences [4]. Through the Mars Student Imaging Project, students will gain important insights and skills that can be applied to all sciences. MSIP incorporates 21st Century Skills such as critical thinking and problem solving, communication and collaboration, information literacy, media literacy, information and communications technology, and flexibility and adaptability when applying their scientific knowledge and reasoning skills to new areas of study. Students will practice and these skills throughout this project.

Meeting the needs of the classroom is a continuing, iterative process! The MSIP professional development and curriculum has continued to evolve over the last decade to stay in step with the changing needs of science classrooms [3]. It is critical that the stakeholders be involved in this process for the program to be successful. Changes have been based on feedback from teachers and students, professional evaluations, emerging national education standards, and changes in technology. MSIP reflects best practices in education and has integrated education research on a continual basis. The lessons were developed following the Biological Sciences Curriculum Study (BSCS) 5E learning cycle [2] and are structured to enable teachers and students without deep knowledge of planetary geology to have successful research experiences [2]. The project is flexible and allows for many avenues of investigation that connect with the traditionally taught disciplines, such as Earth science, biology and chemistry [4].

Professional Development: The Mars Student Imaging Project is seen as many teachers as an “outside of their box” type of project. Most don't have planetary geology experience and are a bit intimidated by the subject matter. Teachers must see direct alignment to their curriculum and have substantial reasons that are defensible to their administrators to be able to participate in non-traditional curricular projects. The teachers have to feel assured that this endeavor will be successful and the time well spent.

To attract and retain teachers in MSIP, our staff has tried many different avenues of support to ensure the success of the teachers and students. We have moved from an “all-inclusive – everything you would want to know or could possibly ask” model of material into smaller, bite-size modules that are not as intimidating and very teacher friendly. We align all materials to the most current science standards available and make the connections to what they teach overt.

To better meet the needs of our MSIP teachers, ASU Mars Education Team has expanded their professional development to provide more online training opportunities to introduce MSIP, give better insights and overviews as to the the lesson components and resources available. The MSIP staff has also maintains virtual office hours to be available as the need arises for quick responses to teachers' needs.

The Mars Student Imaging Project is a collaboration of the THEMIS camera Principal Investigator – Dr. Phil Christensen, the Arizona State University (ASU) Mars Education Program, and NASA's Mars Exploration Program. Since 2002 more than 35,000 students have successfully participated in MSIP. The Mars Student Imaging Project gives students the opportunity to learn how science works by letting them do actual inquiry-based science research using a spacecraft orbiting Mars. The students get to make the decisions about the project, conduct the research and communicate their findings to the Mars scientists. Teams of students have the opportunity to work with scientists, mission planners and educators to complete their project. MSIP can be done as an on-site activity at the Mars Space Flight Facility at Arizona State University in Tempe, AZ or through distance learning. *There is no fee to participate in the Mars Student Imaging Project.*

References:

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