Beyond the Science Lab Cookbook: *BioBLAST*
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BioBLAST helps students understand the interdependence of life on Earth by engaging them in designing a life-support system for a lunar base. The life-support system is based on engineered plant-growth chambers and the total recycling of human and plant waste products as a way to provide the virtual astronauts with sufficient food, oxygen, and water for prolonged missions on the lunar surface. *BioBLAST* will be published as a multimedia curriculum supplement. The interface is a virtual reality lunar base containing computer-based simulations, library readings, videos, and hands-on experiments. The mission culminates with students using a simulation environment to design and test their life- support systems to see if the astronauts will survive for three years without resupply from Earth.

Table 1 indicates how *BioBLAST* relates to the theoretical framework. There are four phases to *BioBLAST*, which correspond to the four phases of scientific inquiry. Students define the problem of life support on the moon during the Orientation phase. This phase involves a video briefing from NASA and a set of introductory experiments related to the core areas of research in *BioBLAST*: human requirements, plant production, and resource recycling. Students develop solution strategies during the Research phase. In this phase, students conduct experiments in the core research areas to understand the important factors that need to be considered for the final life-support design. This phase involves bench-top experiments and computer-based simulations. Students solve the problem during the Mission phase. During this phase, students use a lunar base simulation to design and test their life-support system. Students share the results of the mission during the Reporting phase.

This paper will focus on how students adapt their understanding of cookbook science experiments to the open-ended inquiry-based experiments necessary in *BioBLAST*. The data for this paper is based on structured interviews with over 20 *BioBLAST* beta-test teachers. The data also includes pre/post test data over two years of alpha and beta testing. Students were initially frustrated when the experiments that they designed during the Research phase did not work. This is in contrast to cookbook experiments that usually work every time if you follow the directions properly. This gave students a flavor of real science. However, in the compressed schedule of a school year, it is not possible for students to have very many iterations to conduct their experiments. Fortunately, each of the core research areas has a corresponding simulation program. According to the beta test teachers, these simulations turned out to be a key factor in helping students understand the new activity structure. Students could use the simulations to conduct multiple experiments.