The prospect of going to Mars has become this generation’s shot at the moon. The adventure, the pursuit of scientific discovery and the desire to accomplish a complex feat are driving the goal of putting people on Mars by 2030.

In addition to the difficult task of getting to Mars, creating and managing a facility suitable for human habitation will be a critical need upon arrival. It is this need (and a parallel demand for high-performance Earth-based facilities) that drove the National Institute of Building Sciences (NIBS) and the Total Learning Research Institute (TLRI) to develop the Mars City Facility Operations (Ops) Challenge.

While life on Mars will present very different challenges than those experienced on Earth, many of the requirements for a facility will be the same—maintaining the functionality of building systems to support the needs of building occupants. A highly trained facility management team will be necessary to accomplish those requirements.

Unfortunately, facility management and other building-related careers have a looming personnel challenge here on Earth. The existing workforce is aging, without sufficient new entrants joining the workforce. What can be done to put today’s students on a path to a successful career in the building industry? Using an approach to inspire, engage, educate and employ the next generation, NIBS and TLRI set out to develop a program that utilizes current and emerging technology within the building industry to capture the imagination while exposing students to exciting career opportunities.

Advancing Future Technology while Inspiring the Next Generation
Providing Students the Tools for Success

The program gives student teams the responsibilities for operating the Mars City base under the direction of a team of facilitators made up of teachers and industry professionals. From addressing routine preventative maintenance to preventing serious interruptions of the base’s life support systems, the teams use TMA Systems’ computerized maintenance management system (CMMS) to prioritize and schedule work orders. The students must use critical thinking to prioritize the importance of a request, the availability of technicians and the time required to successfully resolve the issue. The students experience scenarios that were developed by professionals in the field based on real-world experience—including both Earth-based situations and maintenance records from space shuttles and the International Space Station.

The facility management simulation allows students to learn the tools and resources they need to launch a successful career in the building industry. Students conduct all activities in a team environment within the Facility Ops Challenge—much like the teams they will find in the field. Students learn what makes an effective team and how to contribute to the team’s success. An online Building Sciences Career Center features interviews with representatives from 12 building-related fields and resources on 19 different career options.1

The Mars City Facility Ops Challenge helps students to understand the important role building industry professionals play in communities and their own lives. Building professionals plan, design, construct, operate and regulate buildings and infrastructure and assure they remain operational across their intended life-cycle. By assisting aspiring (and soon-to-be aspiring) students to pursue building industry careers, the program is working to fill an essential industry need. Linking high-school teachers and guidance counselors with post-secondary educators and current industry professionals completes the inspire-engage-educate-employ continuum.

The program facilitators are professionals from local chapters of professional societies and related organizations who can provide real-world experience and mentor students in preparation for their future career. Educators from community colleges, vocational programs and four-year programs also participate in the program to help facilitate the students’ transition into post-secondary education options that lead to successful careers in their chosen field.

1http://www.wbdg.org/resources/building-sciences-career-center
Developing the Program

A team of architects, engineers and contractors worked together to create a building information model (BIM) of Mars City, develop scenarios and provide the necessary information about the equipment and spaces to populate the CMMS. The project team used the Construction to Operations Building information exchange (COBie) to transfer information from the BIM to the CMMS. The students are able to fully immerse themselves in an authentic BIM that could actually be built.

Members of the BIM team from architecture firm KieranTimberlake developed a robust virtual reality (VR) walkthrough to help students orient themselves in Mars City, demonstrate some of the cutting-edge tools building professionals utilize and support further project development. The walkthrough includes three different Ops Challenge scenarios so students can immerse themselves in the facility management experience.

Reaching Beyond STEM to Advance the Industry

The Facility Ops Challenge aims to inspire, engage, educate and employ the next generation building workforce. Yet, the NIBS-TLRI project team, by combining the BIM with scenarios, the information embedded in the CMMS and the VR tools, also has found an important opportunity to help current professionals better understand and engage with buildings.

Today’s buildings are increasingly complex. To assure their high-performance features remain operational and deliver the anticipated results, owners need to design for operations and prepare an operations team for a smooth building launch from day one. Architecture, engineering and construction (AEC) firms are beginning to deploy virtual reality, both to support decision making in design and to help owners visualize the finished product. Through the Mars City Facility Ops Challenge, the
NIBS-TLRI project team has identified an opportunity to push these concepts further.

As designers, owners and operators expand the use of life-cycle-based approaches and integrated and performance-based design, they need tools to support optimized decision making for planning, design, construction, operations and renovation. Owners and operators need tools to facilitate smooth handover and support efficient operations on opening day.

Throughout the design process, the BIM can generate and capture building-related information. As this information becomes increasingly detailed, it can support generation of virtual reality walkthroughs that can further support design and facilitate owner and operator engagement. By the time the design has neared completion, most of the information needed to operate the facility should already be in the BIM. By using the proven concepts from the Facility Ops Challenge, the operations team can use COBie to incorporate that information into a CMMS or other management system, even before a shovel hits the ground. A populated CMMS and accompanied VR-enabled BIM can support code inspector plan review, asset management planning; operator training; parts center planning and management; safety drill planning and decision making; tradesperson training on complex installations; and a host of other strategic initiatives. It can even be used to develop scenarios to support training exercises.

Next Steps

The Mars City Facility Ops Challenge presents an exciting mechanism to engage the next generation building workforce and advance how the current workforce delivers buildings.

The NIBS-TLRI project team is in the process of identifying locations to pilot the Mars City student program. Pilot communities require a strong network of professionals and committed educators who have identified the need for dynamic and inspiring programs that establish a path to rewarding careers in the building industry.

The project team is currently in search of a “launch partner” and other industry partners to support finalizing the project content and expanding the program to reach schools across the country. Project partners will be recognized for their support; have early access to the visionary opportunities identified through the Mars City project work; the opportunity to mentor emerging members of the building workforce; and potential professional team-building exercises utilizing the Mars City Facility Ops platform.

CONTACT:
Ryan M. Colker, J.D.
rcolker@nibs.org
(202) 289-7800 x 133

FIND OUT MORE:
www.nibs.org/STEM and www.nibs.org/MarsCity