

SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Enabling the Future - Developing the Space Workforce (5)

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LEAP2 AND LCATS INDUSTRY CLUSTERS: A FRAMEWORK FOR LUNAR SITE TECHNOLOGY  
DEVELOPMENT USING GLOBAL SPACE-STEM EDUCATION AND GLOBAL SPACE-INDUSTRY  
DEVELOPMENT NETWORKS

**Abstract**

Industry clusters, considered the building blocks of modern economies is an economic concept used to identify and define the geospatial density, growth and network behavior associated with innovation and economic performance. Our research uses cluster analysis related to space-STEM education and space-industry to identify aerospace system-sector industry clusters and factors on a global scale related to Lunar Site Technology Development (LSTD). The goal is to document and encourage space-industry cluster network development, facilitating space-STEM workforce and economic development for communities, based on technologies relevant to particular community areas of interest and aerospace resources. Using a wheel model of unique industrial system-sectors needed for LTSD, analyses and documentation of clusters and factors can assist potential system-sector collaborators in commercial exploration architecture development to cluster network participation and design of space-STEM development. Currently, system sector components for lunar exploration architecture: Satellite Communications (Mexico), Mission Operations (Germany), ISRU Vacuum Chamber Test Environment (Korea), and Lunar Ecosystem and Architectural Prototype development (United States) are underway through the LCATS and LEAP2 Global Space-STEM Education Network project, "Lunar Caves Analog Test Sites (LCATS) for Space-STEM Learning Performance", featuring a Lunar Ecosystem and Architectural Prototype (LEAP2). To expand the LCATS and LEAP2 initiative, our research seeks to identify, map, and analyze potential collaborating corporate and industry players representing other system-sector components needed for lunar site development from the perspective of evolving a global space-STEM education network beneficial to the local community of the collaborating organization relevant to their expertise in system-sector component development. Expertise sought includes mining and energy generation; food and waste processing; water production for fuels; vehicles and equipment systems, and logistics, to name a few. Aspects examined include local, regional, and international factors associated with space-industry cluster development that facilitate future exploration architecture collaboration with the LEAP2/LCATS initiative.