

NASA L'SPACE PROGRAM: REIMAGINING AGILE, EQUITABLE, TECHNICAL STEM WORKFORCE

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Introduction: Our world is changing at an ever increasing pace. The challenges to progress as a species we face are getting more complex. The need for an equitable, inclusive technical STEM workforce model that will be ready to meet these rapidly evolving challenges and the opportunities they represent is crucial if humanity it to maintain this planet and reach out to become a multi-planet species.

Challenge of Current STEM Workforce Development Models: The pace of industry evolution clearly reflects this momentum of rapid advancement and demands a STEM workforce that will have the mindset not of stagnation (continuing to do what has always been done), but one of innovation and pushing boundaries.

Preparation of the STEM workforce cannot languish in the past if humanity is to progress and be successful. Instead, the methodologies used to train and prepare the emerging workforce must be agile enough to keep pace with these ever-changing needs. Current and long-used STEM workforce models need to be examined through the lens of not only success in preparing the emerging workforce for past and current needs, but be vetted as to their relevance with the changing demands needed to address critical, complicated challenges.

Status Quo: The current model of STEM preparation has been firmly rooted in academic preparation. Students are steeped in their discipline knowledge through the coursework of their degree program. These courses are for the most part following traditional framework foundations of knowledge that has been designated appropriate for meeting long-standing academic standards needed to confer a particular discipline degree.

Academic programs are, in many cases, locked in to this traditional framework of knowledge and changes in content are not easy to implement without many complicated steps. As a result, updates to higher education STEM-based curriculum to match the pace of a changing world and industry is minimal. Many long-term professors have not had real-world experience and the embracing of bringing in industry experts to inform current state of the art practices and professors of practice (many having less than PhD degrees) has not been widely embraced. Building a solid foundation of knowledge and theory is an important step in learn-

ing. However, it does not provide the practice that will be needed for students to be job-ready in the real world.

The Scale Problem: To gain the practice that will be beneficial for the emerging workforce to be able to relevant and impactfully prepared to address the needs of a changing world, there needs to be enough opportunities available. With shrinking academic budgets, many courses are diminishing their hands-on projects. Students rarely see application of their coursework knowledge embedded in their classes. Even the senior capstone projects are becoming cookie-cutter endeavors rather than stretching students to become innovators.

Partnering with industry to expand the number of hands-on opportunities (such as internships) seems like a good solution, but becomes more of a geographic and social equity problem, especially for rural or lower socioeconomic areas. Traditionally, place-based opportunities rely on regional assets within industry to provide STEM workforce training. As the economy changes within sectors of the country, many areas are deprived of such opportunities. Many of these areas' institutions such as smaller colleges, minority-serving institutions, and community colleges already suffer from lack of funding which impacts basic resources such as labs and more commonly, have a deficiency of staff with cutting edge experience to teach evolving disciplines (e.g., space exploration topics). Industry often focuses on and recruits from successful, higher profile institutions for their opportunities which leaves many underserved and marginalized students uncompetitive and lacking a pathway for applied STEM opportunities.

Re-imagining an Agile and Equitable Technical STEM Workforce Model: Academia is fast becoming not *agile* enough at the scale needed to bridge the gap between traditional STEM student workforce preparation and the needs of evolving industry. With global disruptions such as the long-lasting COVID-19 experience still fresh, we must expand more equitable options for non-place-based technical STEM workforce training.

The NASA L'SPACE Program which is the student collaboration of NASA's Lucy Mission started in the fall of 2018 has been working to fill this gap of applied

knowledge creating a model to do this at a national scale. Prior to the start of L'SPACE in the fall of 2018, we intentionally conducted a needs assessment within the exploration ecosystem to determine their current and future needs in terms of STEM workforce. From this assessment, we designed our 12-week academy curriculum to meet the requirements of what industry need. Unlike academic degree programs, the L'SPACE Program is fast-track and iterative and can change as industry changes to stay relevant to the current STEM workforce needs.

The L'SPACE Program also works strongly in diversity, equity, inclusion, and access (DEIA) to enable students who have been have not had a path forward in STEM career pathways. The L'SPACE Program works to identify barriers that inhibit diverse students and those that are from lower socio-economic and/or first generation students.

Outcomes: Using evidence-based evolution of the program to enable success of all students has been fast-track and iterative and has been transformational in terms of student success. To date, L'SPACE has supported the success of over 7,000 students across all 50 states, Puerto Rico, and Guam, with 41% of the participants being students of color and 40% female. The L'SPACE Program, over the span of 3.5 years has a 93% completion rate.

Beyond the skill acquisition the students are gaining, industry has recognized as these students are getting hired as value-added talent that bring a higher level of workforce skills that go beyond what they gain in academic settings.