

Holistic, Silo-free Campuses through Vertically Integrated Projects (VIP)

Our nation depends on having an educated citizenry who have the skillsets and mindsets to address the grand challenges facing our country and the planet. The workplace of the future will be impacted not just by STEM innovations, but by the convergence of disciplines, increasing workforce diversity, and unforeseen situations like pandemics. Students in STEM fields must learn to collaborate and communicate well with those outside of their disciplines and backgrounds, and ALL students – regardless of major – must have a tangible understanding of the relevance and impact of STEM in the world.

Currently however, higher education typically operates in silos defined by academic disciplines, semesters, levels of education, and divisions among teaching, research, and service missions. Our ambition for 2040 is to **create holistic, silo-free campuses** that will prepare students to navigate continuous changes in knowledge, technology, the workplace, and society. To achieve this ambition, we propose the widespread implementation of scalable **Vertically Integrated Projects (VIP)** (see <http://www.vip-consortium.org/> for the current status of VIP) programs, to engage all students in authentic, experiential learning in which they can apply academic knowledge to real-world, unsolved problems while also learning the professional skills necessary to be able to implement their impactful solutions. While transdisciplinary VIP Programs do exist, they engage a limited number of faculty and students, and VIP is not required campus-wide at any university. Our future requires **rich, transdisciplinary authentic learning experiences for all students.**

This solution of widespread VIP implementation will address many of the issues facing the future of undergraduate STEM (and humanities and arts, etc.) education.

Radical Changes in Knowledge and Discovery

VIPs are designed to be transdisciplinary, with faculty collaborators from different disciplines working together to lead teams of students investigating messy and authentic scholarly questions. Students learn how to collaborate by seeing it modeled, they learn how to communicate across the academic boundaries, and they learn how to apply their academic knowledge and skills to problems that have origins outside of their major disciplines. Moreover, students are also co-creators of knowledge and discovery in VIP's, not passive recipients.

Achieving Equity and Meeting Future Students' Needs

In the VIP approach, equity results not from creating programs that segment students into specific groups or funding expensive, short-term programs, but from increasing opportunities for high-impact learning, reducing barriers to participation, and providing value for both faculty and students to stay engaged over multiple years.

By design, VIP eliminates barriers and gatekeeping that we know reduces participation of students from marginalized and under-served populations and educational backgrounds. VIPs have no prerequisites or applications, which allow students to prove that they are capable of learning to do the work as they participate instead of facing requirements to have prior experience and knowledge. Further, students can apply to be part of a VIP team through an online application and then have the faculty reach out to them (rather than the old mechanism of knocking on a faculty member's door to express interest in

working with them). In this way, students can gain access without the prerequisite of having a sense of belonging.

Moreover, with truly impactful scholarship at the root of the VIP team's purpose, the learning is driven by a social justice goal - how can all students work towards being able to make this world a better place through using their academic knowledge and skills.

Changing Learning Pathways

VIPs are designed for students to stay with a project from their sophomore year all the way through senior year, and even into their graduate degree paths. In this way, they grow with the project, becoming more sophisticated in both their technical knowledge as well as their professional skills. They learn how to mentor by being mentored (and through training modules) and then train the more junior students and teach these newer members of the team. VIP teams can span different campuses, linking two-year colleges with their nearby universities thus creating a well-paved pathway for the community college students as they transition to the four-year degree campus.

The Changing STEM Workforce

Students working in VIP teams are learning how to work on cutting edge important issues of the day through the scholarship of their faculty mentors. In this way, they are learning what the current problems are and what skills are needed to address them. Within these experiences, students learn how to pivot to new lines of inquiry when they encounter dead-ends, failures, changes in the environment, or sparks of inspiration.

In summary, **wide-scale** implementation of VIP programs will transform learning pathways in higher education and prepare students around the world for radical changes in knowledge, discovery, workplaces, and the world. This is the goal of the VIP Consortium, but until the higher education community commits to wide-scale adoption of these learning experiences, we cannot create the critically needed agile workforce and educated citizenry of the future.