

## Innovative Strategies for Integrating ITS/Smart City Competencies into Varied Programs of Study

Programs of study supporting career pathways into careers working with Smart Cities/ITS/Sustainable Communities with a focus on transforming transportation systems as a core focus involves attaining a range of competencies both in traditional transportation engineering or planning programs of study, as well as acquiring academic and technical preparedness in emerging interdisciplinary fields. Sustainability and Smart Cities degree programs are rapidly emerging. In all cases these programs rely heavily on innovative opportunities for students to pursue applied research, experiential learning, other work-based or community service project-based learning experiences focused on preparing students and their communities for transformative transportation systems. Examples of effective models are listed that provide value to student career preparedness:

### Co-Curricular

#### **On-Campus Community Design Units**

Many campuses partner with transportation agencies, local governments and private employers to provide on-campus internship or community service learning experiences to undergraduate students in around different problem sets. These programs provide students with hands-on design and problem-solving experience and exposure to a variety of organizations that also serves to build a pipeline to future careers.

#### **Work-Based Learning**

Many institutions either require or strongly encourage work-based learning experiences for their students through internships. Industry and education institutions can work together to ensure that sustainable transportation-focused experiences and application of related skills are an important component of these student development experiences.

#### **Co-op Programs**

##### Curricular

#### **Engaged Scholarship**

Most universities provide mechanisms to incorporate community projects into student coursework, either through senior design, capstone, or service learning courses. Engagement of transportation organizations with universities to provide transportation-focused course-based projects can serve as a powerful student exposure and recruitment tool to sustainable transportation career pathways. Some universities provide opportunities to scale up these types of engaged scholarship opportunities so that one agency partner can provide multiple projects over the course of an academic year—distributed over multiple departments and colleges across the university—utilizing the Educational Partnerships for Innovation in Communities (EPIC) model spearheaded by the University of Oregon ([epicn.org](http://epicn.org)).

#### **Course-Based Learning**

Integration of safety topics and experiential learning into the classroom can be accomplished in various ways, including incorporation of Smart City and ITS case studies and lab exercises into required coursework; and implementation of assignments that demonstrate understanding of various technologies and processes, through development of ITS and Smart City plans. Job site visits and field trips have also been identified useful tools for promoting student interest.

#### **Competency-Based Curriculum**

A curriculum that meets academic and quality standards, designed and organized by competencies required for jobs and cross-walked with industry skill standards and certifications, can be designed for ITS and entry level jobs in deploying smart city technologies and data collection and management systems. Job profiling and the use of "SMEs" should be considered to meet the competency needs of employers. The proliferation of industry-driven professional ITS certifications can be used to facilitate this process. Programs of this kind may award credit for prior learning, allowing incumbent workers to achieve credentials by demonstrating knowledge and skills developed on-the-job.

#### **Asynchronous Learning**

Provide education and training for students and incumbent workers at times and locations convenient to students and employers, rather than instructors or institutions. This may include evenings or weekends, blended or "hybrid" delivery models, and delivery at off-campus locations.

#### **Problem-Based Learning**

Problem-based learning provides students with opportunities to solve real life problems, often in environments that replicate the workplace (e.g. design within constraints, working on multidisciplinary teams, etc.). Industry engagement with educators to provide real world problem examples and guidance on project constraints enhances student experience.

#### **Work-Based and Experiential Learning**

Incorporate opportunities for "learning-by-doing", including internships, co-op work experience, simulations, and team class projects that are assignments from local employers.

#### **Experiential Programs (examples)**

- **Northeastern University, MA. Transportation Engineering:** <http://www.civ.neu.edu/civ/research/transportation> Offers a co-op program that provides students the opportunity to work in an engineering practice prior to graduation.
- **US DOT Summer Internship Program for Diverse Groups:** <https://www.fhwa.dot.gov/education/stipdg.cfm> A paid internship program to expose students to transportation industry and prepare them for public service.

### Experiential Programs (examples) Continued

- **Mass DOT Engineering Internship:** <https://www.massdot.state.ma.us/Employment/InternshipPrograms.aspx> Opportunities for field-work based internships with a Mass DOT Civil Engineer.
- **Metropolitan Transportation Commission (MTC), San Francisco, CA High School Internship Program:** <http://mtc.ca.gov/about-mtc/careers/high-school-internship-program> Offers internships to high school students to explore the role of public transportation agencies in community, county and regional transportation operations.
- **Volpe: The National Transportation Systems Center:** <https://www.volpe.dot.gov/about-us/careers/student-and-recent-graduate-opportunities> Offers internship programs from high school to graduate level to help resolve real-world transportation problems.
- **ASU ProMod** <https://schoolofsustainability.asu.edu/student-life/student-sustainability-research/promod/>