



STEM Learning Exchanges

by Jason A. Tyszko

As postsecondary education and training takes on an increasingly important role to securing employment, it is disconcerting that such a sizeable proportion of the U.S. population is not prepared to enter college. Reder (2007) cross-validated data from two national studies, the National Household Education Survey (NHES)/Adult Education Component of 2005 and the National Assessment of Adult Literacy (NAAL) of 2003, and found that nearly 14 million Americans have earned their General Educational Development (GED) certificate and another 33 million adults are without any high school credentials. About 30–35% of GED recipients enroll in any postsecondary education, and only 5–10% of these complete one year of college and only 3% complete an associate's degree (Clark & Jaeger, 2006; Murnane, Willett, & Tyler, 2000). At a time when "90% of the fastest-growing jobs will require postsecondary education or training" (Connell, 2008, p. 5), many Americans are unprepared to fulfill these positions. Lacey and Wright (2009) contend that some form of postsecondary credential will be required for nearly half of the new jobs created from 2008 to 2018.

In 2010, as part of the State of Illinois' Round 1 and Round 2 Race to the Top (RTTT) proposals, science, technology, engineering, and mathematics (STEM) Programs of Study were identified as one of the key education reform initiatives that would help promote college *and* career readiness for all learners. Originally developed and implemented as part of Career and Technical Education (CTE), Programs of Study serve as a model for bridging programs across P-20 education institutions and are demonstrated to improve academic achievement, increase graduation rates, and improve transitions to postsecondary education and employment.

Aligned to the National Career Cluster Framework, Programs of Study enable the State's education institutions to align their curriculum, assessments and career counseling with the State's growing economic development sectors thereby ensuring successful transitions to employment and a stronger economy for Illinois. The nine STEM cluster areas identified in Illinois' Race to the Top application include: 1) Health Science; 2) Agriculture; 3) Information Technology; 4) Finance; 5) Architecture & Construction; 6) Transportation, Distribution, & Logistics; 7) Manufacturing; 8) Research & Development; and 9) Energy.¹

Fundamental to the Program of Study approach is the ability to build education program capacity to provide opportunities for learners to choose and explore a program related to their academic and career interests while also providing opportunities to demonstrate real-world skills through applied learning. In addition, Programs of Study provide a framework to promote public-private partnerships between schools, communities, and business and industry as part of a larger P-20 talent pipeline. Also, Programs of Study are designed to improve access and success for underrepresented populations in STEM fields, such as women, minorities, low-income, and disabled students.

One of the key challenges to scaling up Programs of Study for all learners is addressing the capacity issues associated with increasing the number of opportunities available to students in any given district. In smaller or more rural districts there are often resource constraints in terms of teacher training or curriculum and equipment. In other districts a highly focused "college for all" strategy leaves little room in terms of elective opportunities to offer career cluster pathway course options. Given these and many other constraints it was necessary to develop a parallel strategy in Race to the Top to assist districts with launching and implementing STEM Programs of Study.

¹ Eight of the nine identified areas are consistent with the National Career Cluster Framework with the exception of "STEM," which has been renamed "Research & Development" for the purposes of Illinois' STEM initiatives. In addition, the Information Technology (IT) Task Force of the Illinois Workforce Investment Board (IWIB) recommended changing the national IT pathway model to reflect changes in the IT sector. Given the increased investment, policy focus, and emerging occupations related to the energy sector, "Energy" is listed as a separate career cluster based on the recommendation of the Illinois Workforce Investment Board's State Energy Sector Partnership. The "Energy" working group will use this opportunity to identify career cluster pathways specific to the energy sector that can further inform changes to the National Career Cluster Framework.

STEM Learning Exchanges were envisioned as a solution for supporting capacity building and scaling up Programs of Study by forming open-collaborative, public-private statewide networks in the career cluster areas identified above. Using best practices among agriculture partnerships in the state as a model, Learning Exchanges would help connect a network of P-20 education institutions and related education partners--including museums, federal laboratories, after school programs, and community-based organizations--with employers, industry associations, labor organizations, workforce development systems, and others. Learning Exchanges would exist outside of government, business and education, but would provide a new infrastructure that mediates the relationship of all three sectors by voluntary association.

The purpose of this network would be to reduce the transaction costs in identifying a wide range of partners in a given cluster areas as well as to share resources to assist with local implementation of Programs of Study. The nine identified functions of the Learning Exchanges are identified below:

1. Provide e-learning curriculum resources, including on-line courses, assessments and feedback systems, reference materials, databases, and software tools.
2. Expand access to classroom and laboratory space, equipment, and related educational resources necessary to support programs of study through regional partnerships and other strategies.
3. Support student organizations and their major activities, including conferences, internships and professional networking experiences, competitions, and community projects that build leadership, communication and interpersonal skills and provide professional and peer support networks.
4. Provide internships and other work-based learning opportunities that connect students with adult mentors.
5. Sponsor challenges and project management resources for students to work in collaborative teams addressing real-world interdisciplinary problems.
6. Provide professional development resources for teachers and school administrators integrated and aligned across middle school, high school, and community college instruction, including STEM externships, support for web-based networks, and integrated professional development for academic and CTE instructors.
7. Provide career development and outreach resources to expand awareness of STEM-related programs and careers to K-12 students.
8. Provide tools and resources to assist students and schools with implementing personalized education plans and transitions to post-secondary academic and training programs, including establishing course articulation and dual credit opportunities.
9. Review performance of STEM Programs of Study through assessments and work with school partners to continuously improve performance.

In order to assist with connecting cluster partners across the nine identified functions, the State proposed that STEM Learning Exchanges be integrated as part of the development of a statewide instructional improvement platform referred to as a Learning and Performance Management System (LPMS). The LPMS would house, in a “cloud computing” environment, integrated State and local data off of which applications can be efficiently built, innovations can quickly spread, and students and educators can access information and tools to improve student outcomes. The LPMS would enable districts to focus their efforts on use of data rather than technology infrastructure.

Originally envisioned as a K-12 system, the LPMS will now be designed to support P-20 education institutions and support both lifelong and lifewide learning. The LPMS will be designed to support the personalization of student learning through full data integration based on interoperability standards and a common data infrastructure that enables students, teachers, administrators, and other learning partners to:

1. Access and Integrate the full array of commercial and non-commercial e-learning resources;
2. Use learner data from multiple sources to drive instructional improvement and education and career planning and management;
3. Participate fully in global open-collaborative communities (e.g. STEM Learning Exchanges) for student learning, professional development, and continuous improvement; and
4. Improve the business functions of education including financial, human resources, and information technology management.

Shortly after learning that Illinois would not be a recipient of Race to the Top funding, the State of Illinois announced that the application remains the State’s blueprint for education reform, including scaling-up Programs of Study, forming STEM Learning Exchanges, and implementing an LPMS instructional improvement system. The State identified that in order to continue moving forward with scaling-up Program of Study opportunities, public-private working groups in each of the designated sectors would need to be formed in order to develop consensus around model P-20 Programs of Study based on industry clusters.

The goal of the working groups is to develop a model course sequence within a designated STEM industry cluster area and provide a general framework that reflects the P-20 components of a Program of Study. This framework is designed to help establish a series of expectations, assumptions and definitions that will support statewide networks and facilitate connections

between public-private networks in each of the nine cluster areas identified through the Illinois STEM Reform Agenda. In addition, the working groups will identify existing public-private support resources and review existing capacity and labor demand in their respective cluster areas.

The statewide framework product for each cluster area will form the foundation for convening the STEM Learning Exchange. To the extent that a partner can match their local program or support activities to any of the cluster frameworks, then they will have access to a broad-based public-private statewide network in their cluster area.

The State will be convening partners on April 28th in Chicago to review progress on the above mentioned STEM reforms. It is estimated that the Program of Study working groups will submit their frameworks by the end of June with Learning Exchanges forming in the second half of the year. The initial cluster areas will be determined based on demand within the education and employment sectors, available resources through the public-private partners, and the degree of consensus regarding the governance and direction of the Exchange. The State has also been developing a technical specifications report for the LPMS in partnership with the National Center for Supercomputing Applications based at the University of Illinois at Urbana-Champaign.

To learn more about the State's STEM education efforts please contact Jason A. Tyszko, Deputy Chief of Staff of the Illinois Department of Commerce and Economic Opportunity (DCEO), at Jason.Tyszko@Illinois.gov.