



# Changing Pathways in Higher Education: Integration, Project-Based Learning, and STEAM

by Donald L. Birx and Annette M. Holba

If you are familiar with Plymouth State University (PSU) and come to campus, you might notice some recent changes, ranging from a new academic and administrative organizational structure, new open lab spaces across campus, and innovative general education curricula, to an emphasis on project-based learning and community partnerships similar to what is occurring in k-12 schools. The question for all of us is how do we develop the innovative and creative workforce for the 21<sup>st</sup> century and meet the challenges and opportunities we face while decreasing student loan debt, and increasing the relevancy of a college education. Academic institutions have addressed some of these issues through a variety of initiatives including developing an increased online presence, interdisciplinary focus, flipped classrooms, hands-on learning, or in some cases, merging with other institutions. By focusing on integration across channels of engagement, we have changed how we work and who we work with. We describe here our work as integrated, allowing us to shift our focus toward project-based learning and foregrounding STEAM collaborations as a major strength. We conclude with our vision for the future of higher education with the transformation of PSU as the model for raising the bar when it comes to how we do higher education.

## **Integration**

Building upon our strengths and working collaboratively in reimagined and meaningful ways across disciplines, across administrative departments, and across ideas allows our perspectives to

be shaped, augmented, and transformed by others while addressing problems in meaningful projects. In the process, we are finding innovative ways to partner with external publics, getting students in the classroom to be involved with ideas in action.

Structure is an important aspect of our transformation as academic affairs shifts from being organized by three colleges and twenty-four separate departments to seven integrated clusters. These clusters are Arts & Technologies, Education, Democracy & Social Change, Exploration & Discovery, Health & Human Enrichment, Innovation & Entrepreneurship, Justice & Security, and Tourism, Environment, and Sustainable Development. We have taken all our programs, curricula and projects and placed them in these academic homes for students, faculty, and staff while engaging partners from the community and beyond (see attached table). And we are forming common shared open laboratory project spaces for each cluster.

As we advance this new cluster model, there will be a natural evolution with siloization fading away while interdisciplinary and transdisciplinary work come to model our daily communicative practices.

Integrated clusters have been described as “flexible and inclusive, team-based, multidisciplinary structures that encompass faculty, centers and departments, as well as outside partners in the community (including other universities) and are defined by a common theme or broad focus area inspired by a major 21<sup>st</sup> century challenge” (Birx, Anderson-Fletcher, and Whitney, 2013, p. 12). At PSU, we refined this definition as organizational units comprised of students, faculty, staff, and community members who come together to engage in collaborative, interdisciplinary work that transcends individual disciplines.

Connected to the idea of clusters is the concept of open lab spaces where collaborators come together and work with real problems on real solutions. These spaces provide the environment where integrative and immersive learning can occur for all of those involved and for the benefit of solving real problems (Ford, Rajagopalan, and Birx, 2014). At PSU, we refined the definition of open lab spaces as physical or virtual spaces that support engagement in integrated clusters, whether brainstorming, designing, or coming together to think, innovate, create, and engage across multiple disciplines.

Working in clusters is not a totally new organizational strategy. In the modern era, many businesses have engaged in cluster-like initiatives to save or reinvent companies (Bresnahan & Gambardella, 2004); in sociopolitical environments, we have seen cluster-like initiatives forge great social change (Engel, 2014; Huggins & Izushi, 2011). Other models created for interdisciplinary collaborations have been referred to as “invisible colleges” which involve informal collaboration of scholars and scientists that focuses on a similar or related problem which creates a “network of influence and communication” toward finding solutions (Crow and Dabars, 2015, p. 190-191). This collaborative (open lab) environment promotes basic and applied research and engenders interdisciplinary collaboration; this is a radical epistemological transformation that is the antithesis of the silo-centric environment that higher education has come to exemplify since the middle of the twentieth century (Crow and Dabars, 2015).

By creating a horizontal/flattened organizational structure designed to enable streamlined collaboration, the ability to model integrative thinking, learning, and working will enable an interface between education and the marketplace. This kind of engaged, multi-disciplinary, high impact learning, that brings together basic and applied methodologies to solve challenges, is essential for making leaps in discoveries that will move society forward.

Reinvention of a general education is an important element of our transformation that will change perceptions about the relevancy of non-major subject matter. Instead of having a smorgasbord of individual courses that students pick to fulfill their general education requirements, we are theming general education courses together to span across the clusters and plan on offering certificates in these themed areas. This will explicitly enable students to see the relevance between general education courses and the connections with their major. Students will have a vested interest in taking a themed package of courses because it will provide them with a particular skill set or a particular base of knowledge that complements their disciplinary degree program.

Open laboratory spaces are tools to provide support for interdisciplinary collaborations in ways that also alleviate constraints of the standard classroom design and support the interdisciplinary collaborative initiative. As students make progress through their experiences, opportunities to engage in relevant projects focusing on problems or challenges directly related to the needs of the community and businesses grow as does the significance of the work and the leadership role that students assume.

At PSU, we have taken the first steps toward re-envisioning our first year seminar to be organized around a problem or challenge that is complex and that requires multiple disciplinary perspectives working together to seek appropriate responses and solutions to these problems (Rittel & Webber, 1973). This is coupled with project-based learning, an approach to learning that teaches a variety of strategies for successfully solving problems (Bell, 2010) and is being increasingly utilized in k-12 and higher education. By focusing on projects, students drive their own learning through inquiry and collaboration, and in doing so, increase their disciplinary and interdisciplinary knowledge, enhance their communication and collaboration skills, and increase their awareness and experience with new technologies (Bell, 2010).

Putting these elements all together, a student entering the university with an interest in art, might find his/her passion solving a First Year Seminar challenge, with an introduction to the various clusters, and learning opportunities, followed by a series of Gen Ed courses spanning, for example Arts & Technologies (such as writing, digital media, gaming, graphic arts, graphic design, etc.), and would finish by completing a challenging capstone project utilizing the acquired multidisciplinary and collaborative skills.

Today, with the complexities of global economies and interdependence between countries and cultures, providing students with the opportunity to develop the mindset and professional habits of seeing connections and working collaboratively is key to individual success and the sustainability of our world economies, discoveries, and human capacities. This approach, with a coherence between general education, and disciplinary expertise necessary for meaningful and

relevant education allows us to partner much better with our colleagues in k-12 and the businesses in which our graduates will create and work.

Building our infrastructure around integrated clusters and open laboratories enables us to reorient our educational landscape toward assimilation of knowledge and people involved in engaged scholarship with their communities. Integrated clusters create dynamic relationships and advance knowledge creation (Batheit, 2004). Engagement in open laboratories spurs innovation and entrepreneurial thinking and enhances challenge driven exploration and discovery and development of skills and tools to work across disciplines (Braunerhjelm & Feldman, 2006; Cooke, 2002). By being organized in integrative clusters, we provide a natural pathway for project-based learning and STEAM collaborations.

### **Project-Based Learning**

At PSU, the open laboratory facilitates collaboration and exploration and brings in ideas, expertise and challenges from the larger surrounding community. The advances of solving real problems in open lab project-based learning include identifying external partnerships, interdisciplinary collaborations and student learning from the development of their disciplinary knowledge communities.

For example, recently an interdisciplinary project called *Stormy Weather*, was sponsored by the Arts & Technologies Integrated Cluster. This project modelled STEAM collaborations, combining science with music, movement, theatre, and visual arts. Faculty from meteorology, visual art, education, music, theatre and dance, along with students in general education courses, the *Plymouth Parks and Recreation Department*, the community's *Flying Monkey Performance Center and Movie House* and 30-40 children in grades 3-8 from the *Plymouth area* came together to explore four different kinds of storms including thunderstorms, snowstorms, hurricanes, and tornadoes. Their work culminated with an original musical theatre performance and art exhibit, entitled *Stormy Weather* (See photo above).

The purpose of *Stormy Weather* involved learning the science behind different kinds of storms and learning to translate science through diverse mediums within the arts. This project fostered children's interest in science, and provided opportunities for children, PSU students, faculty, staff, and community members and external partners to come together around a shared interest involving understanding weather and its impact on the environments. By bringing awareness to weather phenomena through interdisciplinary engagement and by learning to translate scientific knowledge through various other mediums, new perspectives about both the art and science of weather developed. The potential for transdisciplinary impact in both the regional and national arenas is significant.

Project-based learning provides enriching real world experiences for students that will translate well into their future careers. Studies show that project-based learning can increase grades and result in higher skill application rates than traditional learning environments (Bell, 2010). Additionally, project-based learning has been shown to enhance social learning by increasing collaboration skills and problem solving skills (Bell, 2010). Another advantage to problem-based

learning involves self-reflection, which helps students evaluate not only their learning but also their social interaction skills (Bell, 2010). Project-based learning promotes active learning and increases intrinsic motivation because it is tied to real world problems, real people, real environments, and real solutions that touch the outside world beyond the classroom, providing a natural support for STEAM collaborations.

## **STEAM**

One consequence of economic recession and the increasing competition of developing economies from around the world, STEM education, or education focusing on science, technology, engineering, and mathematics, emerged as a national priority for the United States (Guyotte, Sochacka, Constantino, Walther, & Kellam, 2014). By bringing together science, technology, engineering, and math, observing how these disciplines overlap, complement, and work together toward innovation, problem solving, and developing new perspectives, the possibilities of solving real world problems became a reality.

The critical missing ingredient in STEM was Art. We describe this here at PSU as the need for reintegrating the liberal arts. A STEAM education leads with making connections by focusing on the creative design process so fundamental to engineering and art (Bequette & Bequette, 2012), emphasizing the role of creative and synthetic thinking that enhances student learning in science and math (Wynn & Harris, 2012), and demonstrating the value of exploring science and math that supports artistic technique (Wynn & Harris, 2012). STEAM collaborations that consider a social practice demonstrate concern for community engagement and ecological sustainability (Guyotte et al, 2014). STEAM is an educational approach that leverages multiple disciplines to guide interdisciplinary student inquiry, dialogue, critical thinking, and engagement, which results in preparing students to engage in experiential learning by taking thoughtful risks that lead to decision making about finding solutions to problems and understanding problems differently, by creative collaboration and problem solving. This will better prepare students to be flexible and innovative as educators, entrepreneurs, public servants, and effective citizens in the 21st century.

Using integration as the basis of a comprehensive organizational restructuring (forming 7 integrative clusters) fosters experiences like project-based learning and STEAM collaborations and allows PSU to build on the work being done in k-12 schools. We are at the beginning of a transformative journey which prepares our students to be grounded in creative collaboration, communication and teamwork; well equipped to succeed in ever-changing 21<sup>st</sup> century environments so that we may change the world together.

## **Implications for the Future**

We are building a new kind of university, one that integrates the liberal arts with basic and applied research, technology, service, and teaching in unique ways to give Plymouth State University students the credentialed interdisciplinary skills, in small interactive classrooms that allow them to excel in their chosen field of study. Our students will work with other students, faculty, staff and community members from different disciplines in open laboratories to solve real challenges while building connections with community partners and helping businesses

develop and grow. They will refine their creative abilities by working in teams within and across the seven integrated cluster areas. The integrated clusters resonate with our institutional strengths, serving our broader community strengths and needs that will ultimately be meaningful to 21st century global challenges. This approach will give our students a distinctive edge in transitioning seamlessly to an engaging and successful career in a global trans-disciplinary economy. Our students will be able to create their own companies (profit or non-profit), to emerge as leaders within already established companies, and be well prepared to continue to a graduate school that builds on these concepts.

We are developing world changers and giving our students the lifelong learning skills to make their dreams become a reality and turn their passion into high impact careers. Our goal is for our students to be the most well-prepared and in-demand graduates when they leave Plymouth State University and embark on their life and career journey. Our driving ambition is to provide meaningful educational experiences and transform our students and our community in a way that will have leave a lasting legacy for the next generation.

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**Integrated Clusters**

**Disciplines/Degree Programs**

**Arts & Technologies**

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*Undergraduate:*

Art

Art (BFA)

Art Education (K-12)

Art History

Communication Studies-Media Studies

Communication Studies-Professional

Communication

Theatre Arts

Music

Music Education (K-12)

Information Technology

English

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English Writing

Computer Science

Dance

***Graduate:***

Art Education

Integrated Arts

Library Media

Literacy & the Teaching of Writing

Music Education

Online Instructional Design

Arts, Learning & Leadership (CAGS)

Education Technology Integrator

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***Undergraduate:***

English Education (Teacher Certification 5-12)

Social Work

Elementary Education

Social Science

Social Studies Education (5-12)

Philosophy

Early Childhood Studies-Early Care and Education

Early Childhood Studies-Teacher Certification PreK-

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Childhood Studies

***Graduate:/***

English Education (Teacher Certification 5- 12)

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**Education, Democracy, & Social Change**

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School Psychology  
Curriculum & Instruction  
Special Education  
Elementary Education  
Language Education

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***Undergraduate:***

Anthropology  
Biology (BA)  
Biology (BS)  
Environmental Biology  
Chemistry  
Meteorology  
Interdisciplinary Studies  
Psychology (BS)  
Psychology  
Mathematics  
History

***Graduate:***

Applied Meteorology  
Biology  
Heritage Studies  
Mathematics Education  
Historic Preservation

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**Exploration & Discovery**

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Health & Human Enrichment

***Undergraduate:***

Adventure Education

Athletic Training

Exercise & Sport Physiology

Health Education & Promotion

Physical Education

Nursing

***Graduate:***

Doctor of Physical Therapy

Health Education

Human Relations

Personal & Organizational Wellness

Physical Education

School Counseling

Clinical Mental Health Counseling

Couples & Family Therapy

Experiential Learning & Development

Athletic Training

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**Innovation & Entrepreneurship**

***Undergraduate:***

Accounting

Business Administration

Finance

Management

Marketing

Sports Management

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Economics

***Graduate:***

Leadership Learning and Community Ed.D.

Higher Education Curriculum and Instruction Ed.D.

EDD Higher Education Leadership Ed.D.

Higher Education Administrative leadership (School Principal, Special Education Administration, Reading and Writing, Arts Leadership, Curriculum

Administrator, Superintendent (CAGS)

Educational Leadership (Principal K- 12), M. Ed.

Accounting (MS)

General Management (MBA)

Health Care Administration (MBA)

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**Justice & Security**

***Undergraduate:***

Criminal Justice

Spanish

***Graduate:***

Criminal Justice Administration

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**Tourism, Environment, & Sustainable  
Development**

***Undergraduate:***

Environmental Planning

Environmental Science & Policy

Geography

Tourism Management & Policy

French

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Public Management

Political Science

Sociology

**Graduate:**

Environmental Science & Policy

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