

## Blending Innovation, Student Co-Learning, Entrepreneurship and Informal Education – Innovation 5

Thomas L. Deits.  
Michigan State University  
Katherine LaCommare  
Lansing Community College

### Abstract

We are working to develop a novel facility within Lansing Michigan's Impression 5 Science Center called 'Innovation 5.' Innovation 5 be housed within the Impression 5 building that will bring together students, community members, entrepreneurs, children and their families to learn about and to participate in STEM (Science, Technology, Engineering and Mathematics) - based innovation and entrepreneurship. The space is envisioned as consisting of areas that will enable individuals to learn from and interact with ongoing innovation and entrepreneurship activities at a level appropriate to their age and interests. These interactions will range from informal science experiences for young Impression 5 visitors and their families to an additive manufacturing/rapid prototyping facility where local entrepreneurs and community members can work to develop concepts into marketable products. The unifying theme for Innovation 5 will be student leadership. Students from secondary and post-secondary institutions in the region will form teams as needed to carry out their own projects, support informal education or assist entrepreneurs with their projects. We will report on our progress towards realizing this new concept in STEM education.

**Keywords:** STEM, Conference Proceedings, 21<sup>st</sup> Century Skills, Hands-on Learning

### Introduction

Founded in 1972, Impression 5 Science Center has served over 3 million visitors to date. Impression 5 is currently in the planning phases for a major renovation and reinvention of their space and functions. It is within this planning process that the Innovation 5 concept arose.

One of the dominant themes in education today is the need to promote STEM education and career choices among students and to foster such 21<sup>st</sup> Century skills as teamwork, innovation and entrepreneurship. This is exemplified by the National Science Foundation Innovation Corps (I-Corps) initiative that focuses both on fostering innovation in bringing discoveries from the lab to the marketplace and on entrepreneurship training for students (Robinson, 2012).

Among the most important recent technological advances in recent years is the rise of additive manufacturing and rapid prototyping. Additive manufacturing is defined by ASTM F2792 (ASTM, 2013) and can be summarized as the process of creating a physical object from a digitally encoded design through the deposition of material via a 3D printing process. Rapid

prototyping is a related suite of technologies that uses the tools of additive manufacturing as well as others to rapidly instantiate computer designs in the physical realm. (Vaezi et al., 2012, Center for Bits and Atoms, 2013). This technology is anticipated to have an impact comparable to that of the introduction of the personal computer (Huang, et al., 2012).

At the same time, new products are becoming commercially available that enable younger students to carry out a wide variety of activities that allow them to perform the key steps of additive manufacturing. For example, Loughborough University has launched the ‘Tinkering with Technology’ project to enable primary school students to work with 3D printers (Loughborough University, 2012).

In the informal education world the design/build/measure/revise cycle that is characteristic of the rapid prototyping paradigm is becoming an important learning concept. Many hands-on science museums now offer structured design challenges to their visitors (Boston Museum of Science, 2013). This extension of both the technology and the process of additive manufacturing/rapid prototyping to younger children led us to the concept of creating a working facility within an informal science education context to provide a STEM-centric experience for young people that also gives them a close look at more advanced students and community members engaging in parallel activities to which they can aspire.

It is the goal of the Innovation 5 project to employ the new additive manufacturing/rapid prototyping technologies to both stimulate innovation and economic development in the region. Shipp, et al. (2012) support that additive manufacturing is a key element of the revitalization of American manufacturing and a key element that should be incorporated into our educational system.

### **Planned Implementation**

In order to provide an ongoing resource for operations and new thinking in Innovation 5, we plan a student co-learning group that will have, with Impression 5 staff facilitation, substantial responsibility for the facility. Students will also interact directly with young visitors to Innovation 5. We have begun this process by convening a student project planning team that will serve summer internships developing the various aspects of the Innovation 5 concept in detail.

For young visitors to Impression 5, Innovation 5 will be a center for hands-on activities, engaging them in design challenges that range from goal-directed invention to simple kid-safe additive manufacturing technologies. Innovation 5 will also be a resource for secondary and post-secondary students to develop their own projects and to work with entrepreneurs and young Innovation 5 visitors. Finally, Innovation 5 will itself be a resource for Impression 5 itself.

A business model is still being developed for Innovation 5; grant funding will be required to equip the facility. We anticipate modest revenue streams from facility fees paid by users as well as by increased attendance at Impression 5.

### Findings

After discussions with many of the leading hands-on science centers and funding agencies, we find that the concept of combining an entrepreneurial innovation center of this type with an informal STEM educational environment appears to be unique in the United States. Community response to this proposal has also been very positive.

### Conclusions

We have identified a potentially new concept for engaging students of all ages in STEM activities and problem solving skills while also serving the economic development needs of the region. The concept has been well received and well supported and as of March 2013 we are moving into the implementation phase by convening a student-focused project planning team.

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**Authors' Information**

Thomas L. Deits, Ph.D., is Principal of Thomas L. Deits Consulting, providing services in nanotechnology, biotechnology and STEM (Science, Technology, Engineering and Mathematics) education. He received his bachelor's degree in chemistry and history at the University of California, San Diego and his doctorate in physical organic chemistry at the University of Washington. He has served as a faculty member in the Department of Biochemistry and Molecular Biology at Michigan State University, where is currently and Adjunct Associate Professor. He has also served as Director of Molecular Biology at MBI International, a biotechnology commercialization organization, chairperson of the Science Department at Lansing Community College, where he launched the school's nanotechnology effort, and Program Manager for Nano-Link, a National Science Foundation Regional Center for Nanotechnology Education.

Katherine LaCommare is an Assistant Adjunct Professor at Lansing Community College. She has a bachelor's degree in Anthropology and Zoology at the University of Michigan, Ann Arbor, a Masters of Science in Forestry from Purdue University and a PhD in Environmental Biology from the University of Massachusetts, Boston. She has directed formal and informal educational programming for Oceanic Society, Earthwatch and Lansing Community College. In the fall, Katie will be a full-time Lecturer III at University of Michigan, Dearborn.