The Future of Education: Transforming higher education with integrated competency-based education

Special Issue: Paradigm Shifts in Global Higher Education and eLearning

BY LISA BOSMAN / MAY 2019

The future of education and paradigm shifts in eLearning are a hot topic of conversation for many educational institutions, in particular higher education. The purpose of this article to highlight one university's new approach to transforming global higher education and eLearning with competency-based education, link this new and innovative approach to research, and provide implications and recommendations to build the case for a new teaching and learning paradigm.

This new approach to education was established under a new academic initiative called the "Ten Elements of Transformation, " which states: "We needed to prepare graduates who not only have deep technical skills but who also are innovators and 'makers,' with an attitude of curiosity to learn and connect with others, and the courage to initiate and collaborate for the benefit of society. Further, we need to recognize the importance of humanities and social science studies and integrate those with technology studies." The Ten Elements of Transformation include: global and cultural immersions, team project-based learning, senior capstone projects, modernized teaching methods, internships, integrated learning-in-context curriculum, faculty-to-student mentorship, integrated humanities studies, theory-based applied learning, and competency credentialing.

Under this initiative, a new bachelor's degree program in transdisciplinary studies in technology was developed at Purdue University. It is innovative, experimental, and offers three key transformative attributes. First, it is competency-based in that students are required to show mastery of meeting 20 core competencies. Second, it is transdisciplinary in that learning experiences integrate the humanities into engineering, design, and technology skill sets through design and portfolio courses. Finally, about a third of the required credits are "free credits" in that students are given agency to customize their own educational journey.

A New Approach to Education

Competency-based education. "Competency-based education (CBE) is an outcome-based, student-centered form of instruction whereby students progress to more advanced work upon mastering the necessary prerequisite content and skills [1]." Although CBE is not new, it has increasingly been receiving much attention as a method for reaching a more

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diverse and inclusive student population. Over the past several years, competency-based education has been on the rise for offering vocational education, which prepares people to work in a variety of jobs such as a craft, a trade, or as a technician. This new and innovative approach to education offers for-profit and non-profit higher education institutions, alike, an opportunity to capitalize on a business model allowing students access to self-paced, distance and online learning for completing vocational education. In these cases, competencies are commonly "obtained and demonstrated" by watching short videos, completing assignments, and passing an online assessment demonstrating the students' ability to accomplish a series of learning objectives. However, little progress has taken place and few resources exist that show how to incorporate competency-based education into traditional bachelor's degree programs.

The new bachelor's degree program in transdisciplinary studies in technology has a total of 20 competencies belonging to the five major competency clusters of create and innovate, interact with others, inquire and analyze, communicate, and engage in culture, values and the arts. Students are required to demonstrate mastery of meeting core competencies through submission of an artifact to demonstrate the "doing" and submission of a reflection to demonstrate the "thinking." Mastery is obtained through demonstrating the "doing" and thinking a minimum of three times throughout the first three years of the program, where each time students are required to compare and contrast the new experience from the previous experience. Then, during the two- semester senior capstone, students independently drive and incorporate the competencies into the final capstone project. This integrated approach to competency-based education will culminate with a competency defense, similar to that completed during the thesis or dissertation process.

Transdisciplinary and customized education. A number of studies are available which identify advantages to students who participate in multidisciplinary, interdisciplinary, and transdisciplinary programs. Students develop higher levels of cognitive processing and critical thinking [2], report positive attitudes toward literacy [3], improve research skills [4] and display high levels of teamwork and leadership skills [5]. This is by no means accidental. Instead, a recent study by Borrego and Newswander [6] suggests faculty are intentional about improving specific student learning outcomes when developing new multidisciplinary, interdisciplinary, and transdisciplinary programs. The authors conducted a content analysis of 129 successfully awarded interdisciplinary studies proposals to the National Science Foundation; they discovered five focus areas for student learning outcomes specific to interdisciplinary graduate education including content integration, teamwork, critical awareness, communication, and disciplinary grounding. Yet, challenges associated with new program development still remain. Herz and colleagues [7] designed a undergraduate degree program in bioengineering which included an interdisciplinary emphasis on experiential learning and innovation; the authors cite a number of program development challenges including balancing curriculum breadth and depth, incorporating changes while keeping stability, and operating under the university umbrella rather than being located within a specific department. Furthermore, the vast majority of inter-/multi-/trans-disciplinary programs have been limited to graduate school environments.

The transdisciplinary studies in technology program is transdisciplinary, and although it is housed within the Purdue Polytechnic Institute, it offers learning experiences which integrate the humanities into engineering, design, and technology skill sets. This is done for students through a requirement to enroll and complete six credits of design studio labs (“doing”) and three credits of portfolio (“reflective thinking”) each academic school year. Transdisciplinary education offers a holistic perspective for considering approaches to problem solving typical of those in the workforce existing at the intersection of domains and disciplines, where commonality identification is required to produce something new and unique. The program in Technology requires a minimum of 120 credits. About a third of the credits are general education courses, about a third of the credits are core courses including the design studio labs and portfolio courses, and the remaining approximate third of the required credits are “free credits” in that students are given agency to customize their own educational journey. The benefit of customized education pathways is that is allows students the freedom and flexibility to design and define their own path, focusing on their individual strengths in an attempt to optimize their future workforce potential.

A Few Lessons Learned (So Far)

Purdue University’s bachelor’s degree program in transdisciplinary studies in technology has only recently been approved; the first student to graduate completed the program in Spring 2018. Along the way, there have been some notable stories of challenges, successes, and lessons learned.

First, integrating a competency-based education program into a traditional education structure is no easy feat. Although, much work has been done around competency-based education, especially in K-12 and vocational programs, limited success stories exist highlighting the integration of competency-based education into traditional undergraduate four-year engineering and technology degrees. Being a thought leader and innovator in education is hard work and offers limited return on an institution’s investment of time and energy. In Purdue’s case, this means the administration needs to (and will continue to) support the transdisciplinary studies in technology program leaders and associated staff who are willing to invest their time, energy, and ideas into forging this new frontier. Thankfully, a great support system exists given the expertise, networking and professional development opportunities offered through organizations such as the Competency- Based Education Network (CBEN) and Alverno College, to name a few.

Second, as with any new program comes the “temporary” borrowing of time, energy, and ideas from the campus community. Fortunately, the concept of a competency-based, transdisciplinary, and customizable degree was unique enough to gain interest and attendance from a large group faculty, staff, and administration throughout the university. The diversity of representation ran the gamut of expertise and experience in educational research, STEM and humanities instruction, compliance and program assessment, curriculum development, advising, and administration. Right off the bat, the norm of coming to group consensus was established. Given this approach, big ideas were shared, debates were encouraged, and after a few years the program was officially put on the books. Due to the transdisciplinary nature of the program, allocating resources towards instruction followed a similar approach as the program development, with the "temporary" borrowing of faculty and staff time. However, this time around, group consensus was difficult to obtain which left team members frustrated, feeling under-valued, and only doing the bare minimum to keep the program afloat. The team dynamics and challenges towards coming to consensus quickly caught the attention of administration. After two years, a strategic decision was made to hire two full-time faculty. The change resulted in a dramatic shift towards program ownership, stability and growth.

Finally, the hiring of two full-time faculty and anticipated curriculum changes that were likely to following, resulted in restructuring of the program to be housed in an actual department. There were many advantages to this approach in that policies and procedures at the department level currently existed, whereas, they were non-existent at the college level. Thus, program changes could follow the existing curriculum change process, promotion and tenure decisions could follow the existing evaluation process, and there would be dedicated resources related to facilities and advising, to name a few. However, there are also many disadvantages to this approach. In what was once planned to be a transdisciplinary program is now at risk of being re-developed towards the inherent and ever-present need of improving performance indicators at the department level.

Fortunately, the college is relatively small, only consisting of six departments which allows opportunity for collaboration and strategic planning among the department chairs.

Conclusions and Recommendations

Purdue University and others have made major education improvements in leaps and bounds; however, the paradigm shift continues including global higher education and eLearning focus areas of modular competency-based education, experiential learning, relevant and accessible maker spaces, adapting to the new student demographic, and hard conversations.

Modular education. Anant Agarwal, the CEO for edX, suggests our current approach to higher education is problematic, stating, "The jobs of the future will require a hybrid set of skills from a variety of subject areas. But our current education model has us spending at least three years studying the same singular discipline" [8]. In his 2018 essay titled, "Future-proofing Higher Education Starts with Reinventing the College Degree," Agarwal tells readers we need to reinvent our education system with a focus on customizable, adaptable and flexible program offerings. He recommends modular education as the wave of the future. In this model, modular chunks of education, obtained from a variety of educational institutions, will allow students to leverage their strengths to build the strongest foundation possible as they navigate the careers of the future.

Experiential learning. Tarandeep Singh Sekhon, a marketing director at KidZania and writer for BusinessWorld, provides a persuasive pitch for increased experiential learning as a way for educational institutions to meet future workforce needs. He starts by stating, “Skills like planning, networking, communication, adaptability, leadership, teamwork and so many more are learned through experience. The majority of our day to day functioning is done through experience, then why do we learn from a book?” [9]. Sekhon does make a point to recognize higher educational institutions for offering credit related to internships, co-ops, and other industry experience, but suggests there is much opportunity to incorporate a greater amount of experiential learning directly into the classroom setting. He goes on to comment about the benefits of experiential learning, noting, “This teaches them to not only be independent but when each small task is completed, they have a sense of accomplishment that can really increase their self-confidence. When they complete small tasks all by themselves, they feel empowered to do more tasks independently and efficiently.”

Relevant and accessible maker spaces. Dale Dougherty, often recognized as the founder of the maker movement, co-founded the initial Maker Faire offered in 2006 in San Mateo, CA. In discussing the past approaches to the Maker Faires, he notes, “we’ve been organized around how do you engage kids and making and the idea of maker spaces, but this year is on the future of work. The process should be practical and relevant to some problem a student sees” [10].

Adapting to the new student demographic. Dr. Nancy Zimpher is a senior fellow at the Rockefeller Institute of Government serving as the founding director of the nation’s first Center for Education Pipeline Systems Change. She suggests the future of education starts with knowing our students and responding accordingly. Zimpher states, “The world has changed, and higher education needs to not only change with it but stay ahead of the curve, ready to receive the students who come to us. The future of education is flexibility” [11]. She goes on to say, “This means expanding our operations so that we can meet students where they are, on their time. It means providing an array of avenues by which to earn a degree and support to ensure they complete.”

Hard conversations. Rachel Gorton, instructional technology coordinator, suggests we need to increase technology transparency to optimize student learning, noting that critical conversations are a necessary starting point. She states, “One piece of advice for others is to not shy away from those conversations; they’re integral to making a successful plan and ensuring that all students can be successful” [12]. Gorton goes on to say, “Be willing to examine everything. We looked at the classes we were offering to students; we looked at the time and space and how students re moving through their day and their year and their education as a whole; we looked at where they’re going next and how we are preparing them. It’s a big shift, but it’s always very, very rewarding.”

What is your next move for transforming higher education?

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About the Author

For Dr. Lisa Bosman, a Ph.D. in engineering and a few M.S. degrees (management and engineering) not only resulted in a lot of student loan debt, but also produced a stellar combination of analytical "let's make innovative things happen" problem-solving skills and professional "let's get things done" soft skills. Bosman has a diverse combination of higher education teaching experience working in learning environments including Tribal Colleges and Universities (TCU), community colleges, and universities (public and private institutions, teaching and research-oriented). In addition, she worked for several years as a manufacturing engineer for world-class companies including Harley-Davidson Motor Company, John Deere, and Oshkosh Truck. Her research interests include: (1) decision support systems—solar energy performance, valuation, and grid management, and (2) STEM education—entrepreneurial mindset, energy education, interdisciplinary education, and faculty professional development.

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