New challenges and new opportunities: Competency-based education and the libraries

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NEW CHALLENGES AND NEW OPPORTUNITIES: COMPETENCY-BASED EDUCATION AND THE LIBRARIES

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Abstract

Competency-based education is growing in popularity as a flexible and responsive way to certify and credential the skills students acquire during their educational path. In a traditional course-based degree program common in higher education, students typically take a variety of courses for which they receive a simple letter grade, and, having successfully completed a collection of courses at a ‘C’ level or better, are awarded a degree. Potential employers have legitimately asked, so what do students actually know? Competency-based education attempts to address this question by providing more granularity in describing and documenting individual skills, knowledge, and attitudes students have demonstrated in the course of their educational careers.

Librarians in higher education generally provide one-shot or consultative services for courses, but ultimately, the determination of the student’s competence is often administered by the disciplinary faculty rather than the librarian. Since information literacy can be a small focus of any individual course, students can pass at the course level without demonstrating any information literacy competencies. Competency-based degrees, with their enhanced granularity, provide new opportunities for librarians to interact with faculty to advance student information literacy outcomes.

At Purdue, the Libraries collaborated with the College of Technology in the creation of a four-year competency-based degree program that requires the equivalent of four credits of information literacy badges. These badges are created and administered by librarians, although they are embedded in other classroom experiences. This provides unprecedented involvement in the curriculum and evaluation of student achievement of information literacy competencies. This paper provides an overview of the process by which the partnership between the College of Technology and the Libraries came about, how the program was developed, and a review of the pilot implementation of competency-based courses.

Background

Competency-based education

Amidst the current discussion of accountability in secondary education, a growing movement exists to explore competency-based education as a model where students ‘get credit’ for the skills and abilities they already possess and can focus on acquiring skills they do not yet have on a timeline that works best for them. The assumption is that this can lead to more engagement (since students aren’t reviewing material they already know), faster time to degree, and lower cost to the student, although there is as yet little evidence whether this actually happens [Kelchen, 2015]. Competency-based programs are not new [e.g., Grant, 1979, Utz and Leonard, 1975]. Librarians described the opportunities for ‘library instruction’ in a competency-based environment 35 years ago [Stoffle and Pryor, 1980], and indeed the ACRL Information Literacy Competency Standards utilize a competency framework [ACRL, 2000].

However, competency-based models seemed to lose popularity in higher education in the 1980’s, as they had a strong association with vocational education. According to the Department of Education, a competency is “a combination of skills, abilities, and knowledge needed to perform a
specific task” [NCES, 2001]. This emphasis on ‘specific task’ still hearkens back to the vocational background of competency-based education. Indeed, for example, the National Skills Standards Board promotes and facilitates the creation of competencies for students in associate and certificate programs in different industry sectors [Bailey and Merritt, 1995].

However, competencies can also be used to represent more abstract and encompassing outcomes associated with a general education. The National Center for Educational Statistics (NCES) commissioned a study of competencies appropriate for undergraduates [Jones, 1996], Alverno College has been using a competency-based degree program since 1973 [Alverno College, 2015] and Sarah Lawrence has recently incorporated competency-based assessments as the backbone of their educational program [Jaschik, 2014]. The Competency-Based Education Network [CBEN, 2015] was formed in 2014 as a network of institutions interested in developing competency-based degree programs.

### Badging

Badges have become popular particularly in the information technology industry as a way to demonstrate and share evidence of competencies of interest to employers and peers. According to Havalais [2013] the Open Badge Infrastructure (OBI) that undergirds the latest educational badging initiative “represents a framework for making badges (microcredentials with icons) machine-readable, portable, and verifiable in distributed digital networks…OBI-compliant badges provide pointers to the original work that demonstrates competence. No longer is the institutional endorsement the only source of certification; interested parties can assess the work directly.”

With the added transparency enabled by badges, potential employers have greater access to student achievements, so a better determination can be made of whether the student has the skills needed for a particular position. The badge framework combines the richness of an e-portfolio with an assessment component that indicates which competencies a particular piece of work fulfills, providing an organizational structure for the e-portfolio. Since badges are awarded by certified faculty or instructors, one can be sure that students did indeed demonstrate a particular competency.

### Badging in Libraries

Libraries have started to address the potential of badges, to varying degrees. Perhaps the most comprehensive effort is the project to create Metaliteracy badges [Mackey, Forte, and Stone, 2015], which are offered for credit through the Metaliteracy MOOC to SUNY Albany and Empire State students. Students can earn Master Evaluator, Producer & Collaborator, Digital Citizen, and Empowered Learner badges, with sub-badges in each area. The University of Central Florida has an information literacy badge program that contains 14 badges divided into three categories: Gather, Evaluate, and Use. Students can earn each of the 14 primary badges, and earning all the badges in one category yields a topic badge. Earning all 14 badges entitles the user to the Information Literacy badge. While the badges are decoupled from credit-based courses, instructors can assign the badges to students as a prerequisite or assignment within their courses. [UCF, 2015].

At Portland State University, disciplinary faculty and librarians collaborated on a Provost’s Challenge grant to implement a badge-based course-integrated information literacy curriculum, which was implemented in Fall 2014 [Ford et al, 2015]. Students can earn a variety of information literacy badges, culminating in the Master Info Analyzer badge. In the pilot offering, the creators mentioned difficulties integrating technology, particularly between the badge and course management systems, and with the difficulty motivating students since the badges, residing on a different platform, were seen as ‘extra’ work outside the course activities, rather than as an integrated part of the course [Portland State University, n.d.]. Richland College has also created a Certificate of Information Literacy badge, consisting of the Information Pursuer, Information Searcher, and Information Evaluator badges.[Richland College, 2014]
All of these badge initiatives are very new, developing, projects, and much work remains to evaluate their success and effectiveness as learning tools. The Purdue experience offers yet another early look at the development of badge systems, in this case in support of competency-based degree programs.

**Purdue Polytechnic Institute**

The Purdue Polytechnic Institute (PPI) was developed as a mechanism for transforming education in the College of Technology at Purdue University. Purdue has a long history of ‘pragmatic engineering,’ including a Practical Mechanics curriculum that dates back to 1882. In response to the Grinter Report [CEEE, 1955], which advocated for a bifurcation of choices for students to focus on either scientific or pragmatically oriented curriculum, the, then, School of Technology was formed in 1964, consolidating the applied programs into an engineering technology curriculum [Purdue University, 2014]. The College of Technology has a long-standing commitment to learning by doing, and the Purdue Polytechnic Institute was developed as a way to leverage that philosophy and further transform the curriculum into a learner-centric, holistic experience for students. Instead of a rigid, course-based curriculum, the PPI approach allows students to develop their own path through to a degree, with faculty mentoring. Instead of a degree standing for a collection of courses taken and grades received, the PPI takes a competency-based approach. In the proposed degree program, students will be asked to demonstrate competencies in each of the core areas that define the discipline of technology overall. Additionally, students must explore disciplinary depth and breadth to flesh out their own degree path. In essence, students determine where their passions lie, and, with a mentor, map out a plan to acquire the knowledge, skills, and abilities to succeed in a career path aligned with those passions.

**Transdisciplinary Degree Program**

The organizers of the PPI immersive experience believed it was important to provide a flexible degree path for students, so that they do not have to navigate a credit-based ‘home’ major within the proposed competency-based curriculum. After much discussion of what the new major should be, it was agreed to name it a Bachelor of Science in Transdisciplinary Studies in Technology, reflecting the focus on integrating knowledge from a variety of disciplines while remaining true to the technology origin of the program.

Over the course of the 2013-2014 academic year, faculty fellows worked to arrive at a common understanding and core values of the Transdisciplinary Degree and the instructional approach. Two important components were a spiral model of instruction, where concepts are reinforced and built upon over the course of four years of the curriculum, and keeping a learner-centered approach to the degree, where students, working with their mentor(s), determine what their learning needs are and take courses and/or work on projects to develop the knowledge, skills, and abilities that will meet those needs. Understanding that students will generally not master skills and abilities over the course of one semester, the curriculum was structured in such a way to acknowledge progress toward mastery while providing structure for different levels of competence. Taking language from the Association of American Colleges & Universities’ VALUE Rubric [AAC&U, 2010], the PPI faculty designated competencies as developing, emerging, and proficient, corresponding to expectations similar to 100 level, 200-300 level, and 300-400 level traditional courses, respectively.

In order to facilitate these two components, the course structure was devised to encourage self-directed inquiry. Students would have a common Design Lab and Seminar experience every semester to emphasize the core problem solving strategy of engineering (design) and the ability to make connections across disciplines (seminar). Furthermore, students would be able to sign up for Independent Learning Modules (ILMs) on topics that interest them beyond the scope of the core Design and Seminar courses. Using facilities at Purdue’s Discovery Learning Research Center, classrooms were custom designed for the incoming class of students to allow for flexible interaction among students and instructors as well as construct tangible artifacts.
In the initial development of the Transdisciplinary degree, students would make progress toward their degree by demonstrating competencies, and the decision was made that each competency would be written in such a way that they would be equivalent to one credit-hour’s worth of work/content, i.e., a traditional 3 credit course would contain three main competencies (which might have sub-competencies). In this way, the ability for students to transfer into and out of the Transdisciplinary degree would be easier.

**Library Involvement**

Librarians were invited to participate as Faculty Fellows, with a formal commitment to the program. Over the summer of 2014, two librarians were involved in the design of the Seminar course, as part of a team of six faculty and a similar number of graduate students. The Seminar course was designed to facilitate students achieving competency in oral and written communication, roughly equivalent to the content contained in the first year English and Communications courses that most students take. The librarians participated in the overall course design, collaboratively determining which assignments and activities would be information intensive, and where structured and unstructured support should be given during the semester.

The result of the collaboration was the construction of an information literacy curriculum for the Seminar course, implemented on Purdue’s OpenPassport badging platform [Studio by Purdue, 2015]. The expected student outcomes were drawn from Purdue University’s core curriculum requirement for information literacy [Purdue University, 2012], divided into five challenges and embodied in the InfoSkills badge [Fosmire, 2014]:

- Exploring a Topic
- Searching for Information
- Evaluating Information
- Using and Acknowledging Information
- Know Your Intellectual Property

![InfoSkills Badge](image)

Figure 1: InfoSkills Badge

Each challenge includes a description of the learning outcome addressed, background information to provide context, and assignments or activities to complete and turn in. Although developed primarily for the Seminar course, the authors attempted to phrase the challenges in such a way that they weren’t specific to a particular course. In that way, any project that required the use of information literacy skills could be submitted by the students to meet the outcome challenges.

**Initial Deployment**

In Fall of 2014, the first class of 33 students were admitted to the Polytechnic program. All students enrolled in the two PPI courses, Seminar and Design Lab. Several students took additional courses, but the focus of their semester was the two-course immersive PPI experience which included 11 contact hours per week. Since the PPI courses had to articulate with non-PPI courses, so that migration in and out of the program would not lead to setbacks in progress toward degree, the instructors determined the core learning outcomes for the course and then mapped them to existing courses (in the case of Seminar, to first-year English and Communications courses, and for the Design Lab, a first-year introduction to technology course).

The information literacy component of the PPI experience was situated in the Seminar class, and one of the authors served as a full member of the teaching team. Several mini-lectures were given throughout the semester at appropriate places to support students’ projects. The early mini-lectures included activities that produced artifacts that could be submitted to fulfill badge challenges. In particular, an argumentative essay assignment, which required students to assemble facts to support an argument, was a prime candidate for meeting the information literacy competency.
While most students submitted the argumentative essay to meet some of the requirements of the badge, additional materials that were submitted included work done as part of the Design Lab that discussed design decisions with supporting information, papers written for other courses outside of PPI, and written versions of persuasive speeches for the Seminar class.

Additionally, one of the authors facilitated a session during the Design Lab related to the Exploring a Topic challenge. During the initial part of the design lab, students needed to understand the nature of the problem they were addressing, in this case, what a food desert was, what are the impacts of food deserts on health and well-being, where they are located, and how food deserts can be ameliorated.

**Initial Results**

Overall, students struggled with the competency-based, student-led approach, particularly with regard to their time management in the less structured environment. One common reaction was, ‘why aren’t you teaching us anything?’ This reflected students’ lack of comfort with self-directed, just-in-time learning as a part of open-ended problem solving, compared to the traditional approach wherein the instructor has all the answers and directs students’ actions. Many of the students eventually understood and were able to internalize the self-directed approach, but it took a significant amount of effort to make the switch in learning style. In retrospect, providing more structure and scaffolding for the student-led approach would have been advisable.

In terms of the information literacy component, the results were mixed. Completion of the badges was scattered with some students choosing to do the work and others not. The InfoSkills badge was not directly mapped to any course on the students’ transcript, so that external motivation to do the work was not present. One of the badge challenges, specific to using and acknowledging information, was linked to one portion of a written communication badge, and as such, students submitted material for this challenge. However, only 23 of the 33 students passed even that challenge. None of the submissions was approved upon its initial submission, although a few only needed minor revisions. Other students required two, three, or more submissions before they received approval for the challenge.

This, perhaps, highlights the biggest challenge for the students. Used to a system in which an assignment is turned in, a grade given, and everyone moves on, the competency-based approach required students to work on the project until they demonstrated mastery of the concept at the level specified. Many students believed they could turn in an assignment near the end of the course, not taking into account, despite repeated instructor warnings, the need to budget time for revisions. As a result, many incomplete badges resulted from the first semester, most of which, however, were rectified in the following semester.

**Program Revisions**

As with any good design project, based on the experiences of the first semester, the PPI program revised the curriculum. First, when constructing the Transdisciplinary degree, there were still substantial difficulties in managing the competencies compared to course hours. Faculty were also concerned that there would be difficulty in scaling competencies in this model, particularly in the later years when students explore more specialized topics. Other concerns related to transition to and from traditional courses and programs. If a student took a regular course, how would the course outcomes be translated into competencies? Could a student pass a course but not achieve the corresponding competency? If the student gained some competencies but not others, what grade should be given for the corresponding “course”?

As a result of both practical and theoretical considerations, the second draft of the degree program attempted to decouple the competencies from the courses taken. In the new conceptualization, students will still take 120 credits of courses (including the Seminar and Design Lab each semester) with very few required courses. As a non-course degree requirement, they will also be expected to complete an ePortfolio that scaffolds students through developing and demonstrating their
knowledge and skills in the eight primary competencies that constitute the core of the degree (see Table 1). By decoupling the credits and competencies, the artificial equivalence of one credit-hour = one badge could be dispensed with, allowing competencies to be created more organically. This model also relieves instructors from having to develop cognate competencies for every topic or skill students encounter in their regular courses, allowing them to really hone in on the key competencies that characterize the transdisciplinary technology degree.

<table>
<thead>
<tr>
<th>Use Design Thinking Principles</th>
<th>Focus on framing problem correctly. Investigate many ideas and explore prior art. Prototype and iterate design process to optimize solution.</th>
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<tbody>
<tr>
<td>Communicate Effectively</td>
<td>Develop and express ideas in a manner appropriate for a specific audience, including both transmitting and receiving information effectively.</td>
</tr>
<tr>
<td>Envision and Execute Independently</td>
<td>See a need and address that need effectively. Develop and implement action/learning plans as appropriate.</td>
</tr>
<tr>
<td>Innovate and Create</td>
<td>Demonstrate innovation and creativity in work, integrating knowledge across domains.</td>
</tr>
<tr>
<td>Apply Systems Thinking</td>
<td>Envision, describe, and analyze systems as an entity of interconnected parts acting as a whole.</td>
</tr>
<tr>
<td>Socially Interact on a Team</td>
<td>Engage meaningfully with others and participate in a team, including working with members from other disciplines.</td>
</tr>
<tr>
<td>Apply Disciplinary Knowledge</td>
<td>Develop core disciplinary knowledge in multiple specialty areas. Integrate quantitative and scientific reasoning into multi-disciplinary projects.</td>
</tr>
<tr>
<td>Apply Ethical Reasoning</td>
<td>Assess personal and professional ethical values and the social context of problems students are working on. Act with professional integrity.</td>
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Table 1: Transdisciplinary Degree Primary Competencies

The Seminar and Design Lab courses take on a slightly different purpose in the new degree program. While the Design Lab is still an immersive, ‘build’ type environment, it also serves as a venue for integrating learning in other courses, translating ideas into the creation of artifacts that solve needs determined by the students. Similarly, the Seminar will be a place for the ‘non-build’ integration of concepts students encounter in their other coursework as well as topics introduced in the course itself. The Seminar class will focus more on ideas, potentially distilling different cultural, historical, and social aspects of technologies, which can then be embodied in Design Lab projects. Furthermore, the Seminar course will provide a venue for making the connection between all course work and the primary competencies students need to achieve for their non-course requirements. The mentors will help students connect the dots between projects, reports, and activities they engage with and these primary competencies, encouraging reflective thinking that also assists students to become independent life-long learners.

In this new structure, information literacy becomes embedded in the eight primary competencies. It appears explicitly as one of seven sub-competencies within Communicate Effectively, and as such the InfoSkills badge can still be used to gauge competence. It also is implicit in several of the sub-competencies of Design Thinking, dealing with exploring ideas, assessing options, data management, and disciplinary integration into designs, and Envision and Execute Independently, dealing with identification of additional information needed and knowledge to be gained to complete a task. In the classification of ‘developing, emerging, and proficient’ levels of mastery, the information literacy competencies associated with design thinking are more clearly aligned with emerging or proficient levels of mastery, compared to the InfoSkills developing level of mastery.
Conclusions

Purdue’s first attempt at a competency-based degree program provided ample room for experimentation and learning. As the program structure ran up against the rest of the university, and indeed, the traditional higher-education system as a whole, the authors learned a significant amount about the challenges of creating a system in which both could co-exist. Changes had to be made to the program to enable Transdisciplinary degree students to interact with the rest of the university infrastructure, so the choice was made to encapsulate competencies as non-course requirements for the degree, focusing on key student outcomes.

Many students appreciated the ability to follow their interests and take responsibility for their learning, while others had difficulty adapting to a system that didn’t have the instructor as the central focus, telling students exactly what they need to know. Further, the idea of learning for mastery, in which students don’t pass until they demonstrate acceptable work, was a challenge for most students, particularly at the beginning of the semester.

With regard to information literacy in particular, just as with the rest of the competencies, students didn’t make as much progress as we would have liked. The full information literacy badge was optional for students in the first semester, and students having trouble with the core badges weren’t in a position to take on what they felt were optional tasks. In order to make the information literacy badge more central to the course, it has been codified as one of the sub-competencies of the eight primary student competencies for the major. At the same time, we are discussing the potential of introducing a one-credit equivalent course offering, "PPI Information Strategies," modeled after existing Libraries credit courses, to provide more tangible recognition of information literacy achievements on a curricular transcript and thus extra motivation for students to complete the badge.

Overall, the competency-based approach has empowered librarians to be full partners with disciplinary faculty as developers, implementers, and assessors of student outcomes related to information literacy.

References


