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Abstract

Olin College of Engineering's Library staff set a 2013 academic year goal to transform their instructional program. Grounded in ACRL standards and ABET accreditation criteria, the program would become workshop-based, combining classroom experiences with digital exercises and tools.

Library Director Magnoni began work with a materials science faculty member to design a research rubric for the digital exercise. Following a brainstorming session, a broad outline was created. Magnoni turned the outline into a diagram, and then created the initial exercise as well as a set of research tips for use with the course subject guide. Both the faculty member and Magnoni would collect electronic copies of the exercise. Students would also keep copies for their own reference. To facilitate this sharing, a simple Microsoft Word document was created. The document included page breaks between research elements, and students could document their process, save as they moved through pieces, and then both keep and send copies. The research tips were saved in a PDF document and a course subject guide already existed on the LibGuides platform. These three pieces: an exercise in Microsoft Word format, research tips in PDF format, and a subject guide delivered on the LibGuides platform, made up the test elements.

Two rounds of testing were accomplished in the experiment's first week, with modifications made for different course offerings. In addition to faculty and student feedback, Magnoni realized shortcomings of the three different formats for delivery. Through a conversation with Ricords of Credo, a Literati subscription facilitated the creation of engaging and interactive multimedia learning materials.

This paper will discuss the conception and development of the research rubric, online portal and interactive tutorials, along with assessment and accreditation potential. The feedback and iteration process will be explored, and the value of the library-faculty-vendor partnership highlighted.

Keywords

Partnerships, library/faculty collaboration, library/vendor collaboration, STEM, digital learning activities, research process, instructional design, assessment, multimedia, tutorials, rubrics, information literacy, badges

Part I:

Olin College of Engineering, located in Needham, MA, United States, celebrated its ten-year anniversary during the fall of 2012. Chartered to bring a focus on design, entrepreneurship and project-based learning to undergraduate engineering education, Olin has gained a reputation for engineering innovation and pedagogical excellence in the higher education community. The Bernard M. Gordon Prize, a prestigious award bestowed by the National Academy of Engineering

to recognize innovation in engineering and technological education, was recently presented to the leaders of Olin College of Engineering. A “do-learn” approach is often taken in the classroom, with the application of concepts taught before the formal introduction of the underlying theory.

A small college, Olin has approximately 350 undergraduate students, all majoring in engineering. The ratio of male to female students is almost equal with 54% male and 46% female students in 2011. Each student receives a four-year half-tuition scholarship. Forty faculty members deliver the core curriculum, and students have the opportunity to take courses at nearby Babson and Wellesley Colleges. Olin’s mission is to prepare students to become exemplary engineering innovators who recognize needs, design solutions, and engage in creative enterprises for the good of the world.

Olin’s library is grounded in a core philosophy of multiple intelligences, the need for diverse study spaces, and community-driven collections and services. A realia, or learning objects, collection can be found throughout the space and includes legos, robotics, drafting kits, modeling clay and the like. A materials samples collection of physical objects supports the design and materials curriculum as well as provides inspiration for project work. The physical library space is open 24/7 to the Olin community, and its electronic collections can be accessed remotely via VPN or EZ-proxy. An Institutional Repository run on the Berkeley Electronic Press platform highlights Olin’s intellectual vitality, and the campus Open Access Policy, based on the Harvard model, was adopted by faculty in November 2012. The policy allows authors to retain broad use and reuse rights to their works and also provides greater access to articles.

Information literacy and instruction have evolved over Olin’s short history. The library’s three staff members each wear multiple hats, and everyone has participated in instruction at some point. From the beginning information literacy has been based on available standards, including *Information Literacy Competency Standards for Higher Education, Information Literacy Standards for Science and Engineering/Technology*, and *Criteria for Accrediting Engineering Programs*. The traditional instruction model includes classroom talks by librarians that highlight research strategies and targeted resources. This instruction would be followed with open research time by the students, with the librarian and faculty member available for assistance. The student strategies grew in sophistication as they advanced through their years and coursework. Freshman orientation provided the first opportunity for students to meet library staff and to become acquainted with basic resources and services. Most freshmen would then receive a single instruction point during their first semester Arts, Humanities, & Social Sciences (AHS) class. More advanced instruction was provided in the middle years through science and engineering courses. The senior year provided an opportunity for the library director to meet directly with each student to discuss their senior research project. This one-on-one meeting provided the template for students who would largely enter the corporate work environment and hopefully have a corporate librarian as a resource.

Part II:

Olin’s library staff set a 2012-2013 academic year goal to transform their instructional program. Leaving the lecture and exercise model behind, the program would become workshop-based, combining classroom experiences with digital exercises and tools. This newly designed interactive experience would model Olin’s own do-learn philosophy, while also approaching the concept of the “flipped classroom.”

Library Director Magnoni began work with Chachra, a materials science faculty member, to design a research rubric for Olin’s *Structural Biomaterials* course. This course includes sophomores, junior

and seniors with varying levels of research skills. The students are asked to collect scholarly articles and relevant books on a research topic. Following a brainstorming session, a broad activity outline was created (Figure 1). Magnoni turned the outline into a diagram, and then created the initial exercise as well as a set of research tips for use with the course subject guide. The rubric would begin with the most general research strategies and exercises, and then become increasingly focused. Acknowledging the student use of tools such as Wikipedia and Google, the rubric specifically begins with the Internet and a brainstorming session of keywords and citation collecting. As keywords and citations are collected, the rubric turns to the library's federated search engine, and then to specific databases. Along the way citations and articles are collected. A challenge for students at any level is making the connection from a citation to actual Olin content. While link resolvers are in place across databases and in Google Scholar, the links rarely resolve to the record level, and often resolve to a citation where the full content is not actually owned. Students must learn to recognize whether full content is owned and how to access it, or where to find the Interlibrary Loan form and request material. Working through this piece of the research process within a workshop session allows students to receive instant feedback that has the potential to relieve significant research frustration.

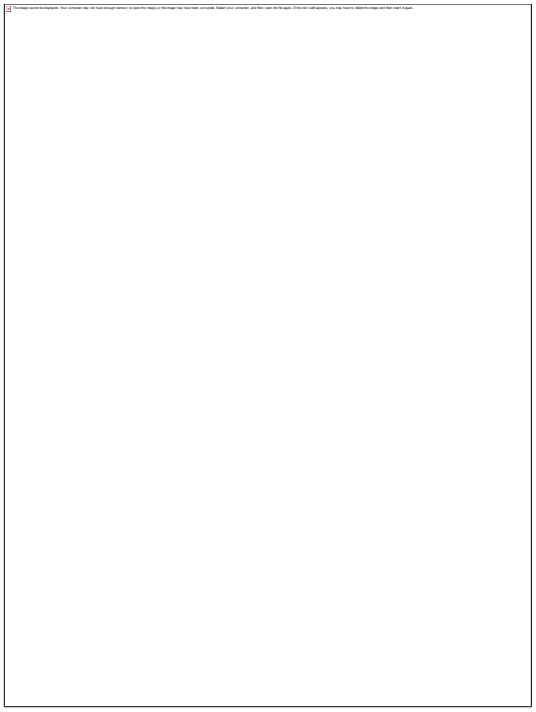

Figure 1. Original research activity outline.

The rubric provided a flexible model that could be modified for course levels and for content modules. For example, citing resources is often identified as a skillset that needs development. A citation instruction module could easily be plugged into the rubric and customized for a specific course. Other modules could include social media research tools and specific engineering modules such as patents or standards.

Assessment of the rubric and the student research process were both important in the exercise development. Chachra and Magnoni would collect electronic copies of the exercise. Students would also keep copies for their own reference. To facilitate this sharing, a simple Microsoft Word document was created. The document included page breaks between research elements, and

students could document their process, save as they moved through pieces, and then both keep and send copies. The research tips were saved in a PDF document and a course subject guide already existed on the Springshare LibGuides platform. These three pieces: an exercise in Microsoft Word format, research tips in PDF format, and a subject guide delivered on the LibGuides platform, made up the test elements.

The rubric would need to be tested beyond a materials science course to ensure its flexibility and adaptability across the curriculum. Magnoni reached out to three other faculty members who all agreed to have the new format used in place of more traditional library instruction formats.

Part III:

Two rounds of testing were accomplished in the experiment's first week, with modifications made for different course offerings. Two more rounds of testing came within a few weeks. Obvious modifications for different course subjects included changes in the vocabulary and strategy of examples. Small improvements were found with each round. For example, early on both "papers" and "journal articles" were used in the exercise to refer to the same material. This language was normalized in later exercises. Toward the beginning of the exercise students were instructed to "begin to collect citations." Later in the exercise students were told to "perform a citation search." The former set of instructions provided a general framework for identifying and collecting journal and other material citations. The latter set of instructions stepped students through the Web of Knowledge forward and backward citation exercise as well as sorting papers by times cited. However, the language of the two sets of instructions was ambivalent. To embrace the spirit of time in the Web of Knowledge search, this piece of the exercise was renamed "follow a citation through time." One faculty member wanted to make sure that her students were aware of tools for saving citations and building bibliographies. A module was added to her activity to cover this material.

In addition to faculty and student feedback, Magnoni realized shortcomings of using a Microsoft Word document as the exercise vehicle along with a PDF document for research tips and a course LibGuide. Jumping between the materials was awkward, and the completed exercise was a somewhat messy document. While messy, the exercises did quickly illustrate where there were issues in the research process, providing valuable feedback to the faculty member and to Magnoni.

Part IV:

The opportunities and challenges that faced Olin College are common to many academic librarians that find themselves charged with the creation of engaging and interactive multimedia learning materials that promote information literacy in the classroom and beyond. A recent survey shows that the most common types of learning materials created by academic librarians are videos, tutorials, and quizzes (Mestre, 2011). While there is a need for developing pedagogically rich materials at Olin College - an institution that prides itself on providing unique learning experiences to enhance critical thinking - several factors make development of multimedia a challenge:

- Sophisticated users: Students expect educational multimedia materials to mirror the technology found on the open web. Once engineers, Olin students will need to use online resources in an efficient way for their careers.

- Cost: Video production and editing software is costly and requires training to overcome what many perceive as a steep learning curve.

- Limited Staff: Even with resources and expertise, creating these materials takes time, and the ever-changing nature of technology requires time to stay abreast of the latest features and trends. With three staff librarians at Olin, creating and supporting modules would be a significant allocation of time.

Olin librarians chose to build on their internal faculty partnerships with a vendor partnership to overcome these common challenges and transform their instructional needs into multimedia modules designed to enhance critical thinking and information literacy in the core courses. Through a conversation with Credo, a library and educational technology company, a more advanced and elegant delivery methodology was envisioned.

The remainder of this paper will provide an overview of the process to create instructional modules to meet Olin's engineering needs, as well as highlight what worked well during the collaborative research process between Olin librarians and Credo. Olin librarians and Credo demonstrate the experience of becoming strategic partners, tools for successful collaboration, and lessons learned.

As a subscriber to Literati by Credo the instructional design work was part of Olin's services. Literati is an information literacy platform that integrates faculty and student outreach, multimedia instruction and assessment tools and resource discovery led by reference content. A goal of this paper is to share best practices that can be used by any institution with instructional or outreach needs, not only those with a subscription to Literati.

The customized components of Literati appeal to the unique learning environment at Olin College. The collaboration began with customizing the product with language that best meets the needs of Olin students and the institution's resources on a subject-basis, making Literati a portal for understanding the library. Magnoni advised how to configure the teaching and learning tools within Literati, such as Topic Pages and the Mind Map, to be most useful to Olin students beginning their research process.

The Literati Customer Solutions Team collaborated with Magnoni to create multimedia materials based specifically on the engineering course learning outcomes and institutional resources available to students. These instructional multimedia materials are accessible in the Literati platform as well as through persistent URL addresses disseminated by the Olin College librarians.

The partnership with the Literati Customer Solutions Team enabled Olin's librarians to develop multimedia materials to help inform student perspectives in key research courses for the engineering students. Modules mirrored the activities that Magnoni developed with faculty members, but utilized interactive components, links for further learning and reporting to both librarians and faculty.

The instructional design process utilized by Olin libraries the Literati Customer Solutions Team contained the following steps:

1. Initial brainstorming: Discuss key priorities and needs and bring any syllabi, PowerPoint decks or other instructional materials. For Olin College their pre-work with the faculty on the modules was crucial for this stage.

2. Process outline: Confirm the general format and scope. This step is crucial for establishing learning outcomes throughout your team.

3. Development of storyboard: Creation of a draft focused on the language of the instruction. Often features placeholders for activities and images, which will be further developed in the next step of the process.

4. Development of assessment components: Create draft text for activities and/or quizzes based on the agreed-upon outline.

5. Development of multimedia material: This steps brings together the drafts created above, revised with any feedback, into the final technology that meets your institution's needs. By saving the technology work until the final step, revisions are limited.

The success of these materials relied on the valuable insights of Olin librarians and faculty, to address themes both relevant to Olin and specific to the courses receiving information literacy instruction. With the pre-work completed during the first phase of the project, the creation of the multimedia materials was shortened. Olin College's tutorial on the research process is intended to provide increasingly focused guidance on research strategies. Please see below for two screenshots from the learning activity. The first screenshot (Figure 2) of the tutorial shows the introductory information for the activity. It was customized to make the Olin College undergraduate students feel comfortable and secure with the project and uses images from their campus. The second screenshot (Figure 3) shows "Step 2" of the activity. Please note the yellow box below the activity where the student's research record is being formed. It was important to make sure this area is interactive, allowing students to copy and paste the resources they are gathering.

Figure 2. This screenshot shows the opening page of the digital learning activity.

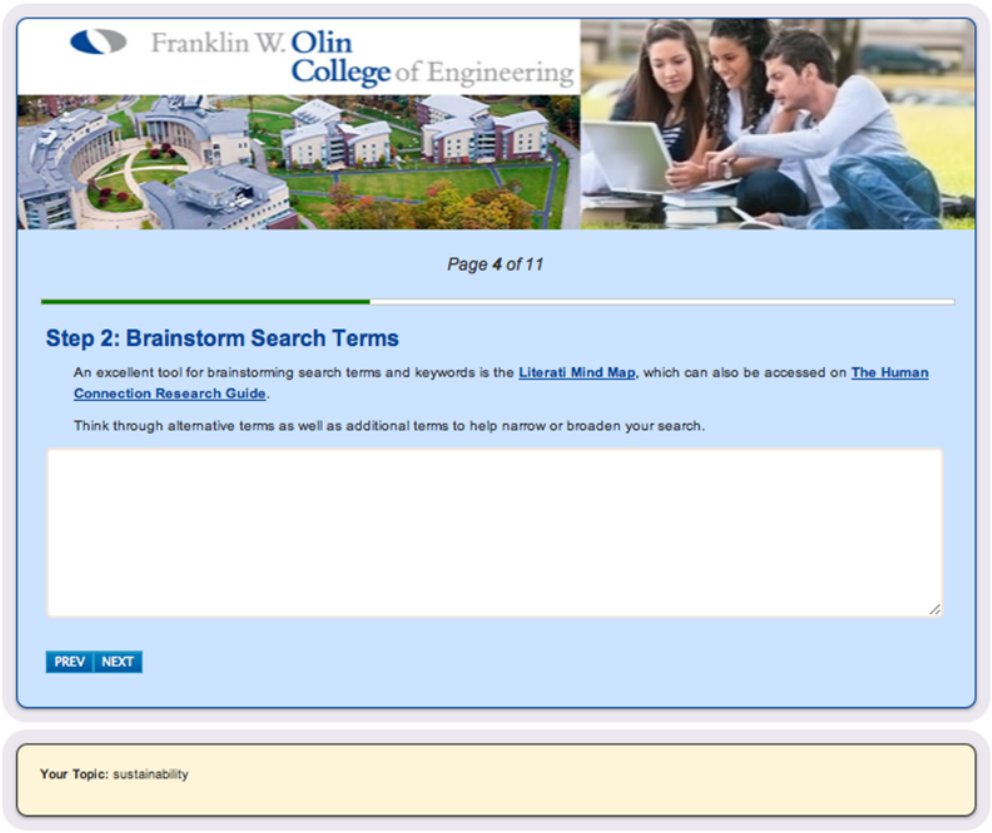

Figure 3. This screenshot shows “Step 2” of the activity with the research log at the bottom.

Both the librarians and faculty members are able to view their students’ work in this tutorial through a back end system. This was important for both grades as well as intervention for research help. Students are emailed a copy of their work and have the option of downloading a PDF at the close of the tutorial.

Plans have been made for further multimedia materials to enhance the modules, such as videos on scholarly abstract-writing in partnership with faculty and how to find full-text content owned by Olin College. The next large project will be collaboration on the development of Engineering Research Portfolios.

Given the importance of Olin’s goal to transform their instructional process, Olin librarians partnered with the Literati Customer Solutions Team to design comprehensive usability testing that captured student feedback about the new modules. Usability testing of the tutorial took place at Olin College Library on Friday February 22, 2013. Morae software captured audio and video of the participants as well as their screen. Four Olin College students participated in the test. Each session lasted approximately one hour.

The participating students had the following academic information:

1. Female, Senior, Engineering with concentration in interaction design
2. Female, Senior, Electrical and Computer Engineering

3. Male, Junior, Engineering with concentration in computer engineering

4. Female, Sophomore, Electrical and Computer Engineering

The testing included brief questions before completing the tutorial, observing the students complete the activity, and then post-questions and a written survey afterwards. In the post-test survey students rated the tutorial from 1 (strongly disagree) to 5 (strongly agree). The questions about whether the information in the tutorial is relevant to my needs received an overall rating of 4 and the questions about the attractiveness, graphics and text all received scores of 4 or higher as well. From both the observation of the students and the post-test questions, it was clear that some changes could be made to help the students feel secure with their understanding of some of the activities in the tutorial and how to navigate throughout the module.

Immediate changes to the learning activity were made to emphasize the learning outcomes and help with navigating the most difficult parts of the activities. The order of the first three steps of the activity was reorganized to reflect the natural workflow of the students. Also, “information help points” were added throughout the tutorial to increase student confidence in their work. For the next version of the tutorial, technical updates to the navigation buttons and the student record of the research process are being explored. Further testing will be completed for these three current tutorials, including a research log assessment activity to gauge the impact the tutorial and a focus group with faculty members.

Part V:

Looking forward, Magnoni envisions expanding the activity concept beyond Olin’s campus to a collective skills badge project. Kevin Carey discusses the use of badges at universities in a 2012 article (Carey, 2012). Academic libraries can begin to partner on educational learning modules, creating a shared badge program that is tied to information literacy standards. These badges would cover such core concepts as copyright, citing research, patents, standards and the like. An association can provide the professional project setting, and vendors can partner to leverage specific skills and software. Credo has agreed to design badges, and Springshare has agreed to host the proposed learning platform. Please see below (Figure 4 and Figure 5) for drafts of the badges being created for this project.

Figure 4. Draft data badge.

Figure 5. Draft copyright badge.

A shared set of badges that can be earned by undergraduate STEM students anywhere, anytime will free specialized staff at institutions to focus on advanced instruction and more individualized student and faculty interactions. Badge programs are already in place or being developed in universities such as Purdue, Carnegie Mellon and the University of California. The Mozilla Open Badge Infrastructure provides specifications to organizations who wish to create badges, as well as badge storage with their *Backpack*, where individuals can save and track their badges.

Technology continues to increase in sophistication, and improved design enables friendlier and more accessible interfaces. Academic librarians are increasingly working beyond their school and country borders. Information literacy conversations happen in local, national and international settings. Olin's journey through the development of engaging and interactive multimedia learning materials is a single case of material that can be developed and leveraged for the benefit of a broad learning community.

Bibliography

Accreditation Board for Engineering and Technology, Inc. (n.d.) *Accreditation Criteria and Supporting Documents.* Retrieved from: http://www.abet.org/accreditation-criteria-policies-documents/.

ALA/ACRL/STS Task Force on Information Literacy for Science and Technology. (n.d.) *Information Literacy Standards for Science and Engineering/Technology.* Retrieved from: http://www.ala.org/acrl/standards/infolitscitech.

Association of College and Research Libraries, a division of the American Library Association. (2000). *Information Literacy Competency Standards for Higher Education*, January 18, 2000. Retrieved from: http://www.ala.org/acrl/standards/informationliteracycompetency.

Carey, Kevin. (2012). A Future Full of Badges. *The Chronicle of Higher Education, April 8, 2012. http://chronicle.com/article/A-Future-Full-of-Badges/131455/.*

Chronicle of Higher Education. (2012) "The Digital Campus." *The Digital Campus Report*. Chronicle of Higher Education. Web. 27 Feb. 2013. Retrieved from: http://chronicle.com/section/The-Digital-Campus/491/.

Codex: Journal of the Louisiana Chapter of the ACRL 2.1 (2012): 25-35. *Faculty/Librarian Collaboration*. Web. 27 Feb. 2013. Retrieved from: http://acrlla.org/journal/index.php/codex/article/view/60/112.

Corporate Member Council, American Society for Engineering Education. (2013). *Global Engineer Project 2013*. Retrieved from: http://www.sefi.be/?p=2850.

Fosmire, Michael. (2012). "Information literacy and engineering design: Developing an integrated conceptual model," *IFLA Journal,* March 2012, vol. 38 no. 147-52. doi: 10.1177/0340035211435071. Retrieved from: http://ifl.sagepub.com/content/38/1/47.short.

Howard, Jennifer. "Libraries Have a Key Role in Academic Accountability." *Wired Campus*. Chronicle of Higher Education, 5 June 2012. Web. 27 Feb. 2013. Retrieved from: http://chronicle.com/blogs/wiredcampus/libraries-have-a-key-role-in-academic-accountability/36497?sid=wc&utm_source=wc&utm_medium=en.

Mestre, L.S. (2011). Learning objects as tools for teaching information literacy online: A survey of librarian usage. *College & Research Libraries, 72*(3), 236-252.

Mozilla. (n.d.) Mozilla Open Badge Infrastructure (http://openbadges.org/en-US/).

New Media Consortium (NMC), (2013). "Sparking Innovation, Learning and Creativity." *NMC Horizon Report 2013 Higher Education Edition*. Web. 27 Feb. 2013.

Oxnam, Maliaca. "The Informed Engineer," *33rd ASEE/IEEE Frontiers in Engineering Conference*, November 5 – 8, 2003. Retrieved from: http://depts.washington.edu/englib/eld/fulltext/1443.pdf.

Purdue University. (n.d.) Purdue Open Passport (https://www.openpassport.org/).

Tumbleson, Beth. "Embedding Librarianship in Learning Management Systems: A How-To-Do-It Manual for Librarians." *ALA Store*. 2012. Web. 27 Feb. 2013.

Quality Free Online Resources:

Guide on the Side (Open source tutorial code created by Arizona University Libraries): http://code.library.arizona.edu/gots/

Khan Academy (Free online tutorials): http://www.khanacademy.org

MERLOT (Multimedia Educational Resources for Learning and Online Teaching): http://www.merlot.org/merlot/index.htm

Prezi (Tool (free for educators) that can be used to create tutorials): http://prezi.com

Xtranormal (Free online instructional design tool): http://www.xtranormal.com