Work-In-Progress: Collaborating with Librarians to Help First Year Students Explore Engineering Disciplines and Improve Research & Writing Skills

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Abstract **- The ease of Googling on the open web makes it increasingly unlikely that our incoming students will make the extra effort to search for good quality sources through the library website. Few first year courses focus on finding good quality information within the majors. Thus, students struggle to catch up in subsequent years when assignments require more sophisticated research. In order to get students to learn about engineering research, we introduced a two-part assignment through our required first year Fundamentals of Engineering Design (FED101) course. We created a library assignment that would help widen their knowledge and understanding about various engineering innovations, but also strengthen their research skills.**

Index Terms – first year students, engineering research, using the library effectively, writing skills.

INTRODUCTION

Our Fundamentals of Engineering Design (FED101) is a course that introduces incoming students to engineering design, various engineering disciplines, and how to succeed as an engineering student. It is their first opportunity to begin to think about what type of engineering projects interest them and 'try on' the profession. At the same time it teaches students to use information effectively in a digital world and improve aspects such as critical thinking, writing and research skills.

Alarmingly, many students do not even realize that the sources they consult are not of high quality nor are they reliable. In addition, very few first year courses focus on finding good quality information within the majors. Thus, students struggle to catch up in subsequent years when assignments require more sophisticated research.

LITERATURE REVIEW

Engineering educators have proposed and disseminated a curriculum designed to increase engagement and retention of beginning engineering students. The "Design Your Process of Becoming a World-Class Engineering Student"[1] was the foundation of the curriculum in this study, with our added goal of improving information literacy. Information literacy instruction and assessment has been widely studied in the library community, but the literature pertaining specifically to interventions in the engineering curriculum have been less often reported. Researchers have examined the engineering design reports of students for evidence of information literacy [2]. Zhang, et al.[3]created a hybrid curriculum that utilized the course management system for first year engineering students, compared the methods of instruction and concluded that blended learning was beneficial. A collaborating librarian, instructor and advisor worked to integrate an engineering writing task with revisions into a first year engineering course [4]. Scharf [5] also used a brief researched writing task to introduce information literacy to engineering students in a technical writing course. Using a rubric to assess information literacy in the student reports she found a significant improvement in research, writing, and citing skills. Our study brought together several of these strands in utilizing a writing task on a current engineering innovation within a hybrid online/face-to-face course environment. It was designed to familiarize and engage freshmen students in the variety of real-world engineering innovation.

THE IDEA

In order to get students excited about engineering while learning about innovative research, we introduced a two-part assignment through our required first year FED101 course. The assignment would not only help widen students' knowledge and understanding about various engineering innovations, but also strengthen their research skills. This assignment was used in two different FED sections – Engineering Science (ESC) and Civil Engineering (CE). The Engineering Science population at our university consists of students who are still-deciding on their specific major. Research articles were picked to cater to each specific population of students. The articles for ESC students were broader to help them explore different engineering majors. The articles for Civil Engineering FED section helped them delve deeper into their major.

In part 1, students chose one online article from a list created by instructors and librarians. Students were asked to

find the article though the library website, read it carefully and write a one-page summary. For part 2, students conducted their own research and found two more articles from the library website that either supported or opposed the views presented in the first article they had selected. Students submitted a final two-page report describing the innovation and why it is important. They had to use evidence from all the articles to support their main ideas, use in-text and full references correctly, conclude by synthesizing the issues and suggesting possible future research needed. This activity was made possible by collaboration between university librarians, FED101 instructors, and the engineering dean's office. Students received clear instructions, guidance and help every step of the way. This activity was well-received by the students and seem to achieve the instructional goals set by faculty. Students became interested and excited about a particular area of engineering and familiar with innovative research areas. They demonstrated basic information literacy, and practiced writing a report in a precise and concise style. This activity will become a permanent part of the FED101 course syllabus for ESC students and we plan to propose the idea to other engineering departments for their FED101 sections. Formal assessment using a validated rubric for information literacy and a survey to measure student engagement is planned.

PREPARATION

The following instructions were given to students to get started with the exercise.

STEP 1: Complete the following tutorials

1. Research Tutorials (http://researchguides.njit.edu/tutorials): Complete all nine tutorials before moving to the next set. These tutorials will help you get started with engineering research.
2. Communication: Thinking, Reading, Writing, Speaking: Tools for All Writers: (http://researchguides.njit.edu/communication) Familiarize yourself with the tools listed on this page. They will come in very handy in improving your professional writing, especially report and research papers.
3. How to Evaluate Information Sources (http://researchguides.njit.edu/evaluate) Also read more about the CRAAP Test (http://researchguides.njit.edu/evaluate/CRAAP)
4. Read the Research Guide on Citation (http://researchguides.njit.edu/citations)

METHOD OF CONDUCT

Part I

STEP 1: Pick an article from the list of articles provided.

STEP 2: Locate the article you picked using resources on NJIT's library website. Write a 1-2 page paper summarizing the article. Critically analyze the article. Is the evidence strong? (This will help you figure out what type of article to choose for Part 2.)

Part II

STEP 3: Find at least one or more articles (recommended number of articles = 2) from the NJIT library where the authors either agree and support the information presented in article 1 OR disagree and expand your thinking about potential problems or issues related in some way to the article you used in Part 1.

If the article chosen is positive about the benefits of the technology, find one that focuses on potential problems or issues, or one that presents more information/evidence about the benefits of the technology.

Use the information from the Research Guide on "How to Evaluate Information Sources" to evaluate the quality of the article you found. Use the criteria in the "CRAAP test" and make sure it is of equal quality to the article you chose from the list in Part 1.

Identify specifically how the evidence or arguments in these articles contradict or expand the information presented in the first article.

Here are some of the things to be included in the report:

- An introductory paragraph that talks about the article you have researched, and the reason your audience should care about it.
- Hypothesis statement
- Summary
- Use evidence from all the articles to support the main idea
- Cite in-text and provide a full list of references at the end
- Your conclusion synthesizing the issues and possible future research needed.

Some of the examples of diverse articles given for two majors are:
Sample Articles for Engineering Science

1. Arabani, M. (2011). Effect of glass cullet on the improvement of the dynamic behavior of asphalt concrete. *Construction and Building Materials*, *25*:1181-1185.
2. Kosowatz, J. (2017). High-Tech Eyes. Mechanical Engineering, *Advances in Vision Technology.139(3),* 36-41.

Sample Articles for Civil Engineering

1. McConnell, A. (2017, Oct) Wheels up, wheels spinning: As drone technology takes off, solutions are needed. *Roads & Bridges*. *55(10)*: 30-34. Database: Academic Search Premier

2. Shamshad, A., Das, S.K., Rao, B., & Rao, B. Hanumantha. (2017, Dec). Characterization of coarse fraction of red mud as a civil engineering construction material *Journal of Cleaner Production.. 168*: 679-691.13p. Database: Business Source Premier

STUDENT FEEDBACK

The authors plan to collect student feedback through a survey before the end of the semester and share it in the final draft of this paper.

RESULTS & DISCUSSION

Incorporating a research component along with a sound academic foundation enables students to develop independent critical thinking skills along with oral and written communication skills. The research process impacts valuable learning objectives that have lasting influence as undergraduates prepare for professional service. Faculty members at teaching intensive institutions can enhance learning experiences for students while benefiting from a productive research agenda.

Participation in an undergraduate research experience also benefited students in areas that can reach beyond academia.
- Learning to work independently
- Understanding how knowledge is constructed
- Self confidence
- Understanding that assertions require supporting evidence
- Clarification of a career path

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