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GIFTS: Building a sense of connection to campus and engineering identity through information literacy

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Introduction

This unit of study began as a way to support general education outcomes and support ABET guidelines in the first year. As the unit progressed it became a way to support those students who were considered not college ready in English and give a connection to the field for students who would not have engineering coursework for at least one year. In its current form, this curricular unit provides support for different forms of writing, information literacy (IL), research, and connects students to their chosen field, the campus and individual instructors throughout the college of engineering.

This curricular unit consists of five sessions with the embedded engineering librarian and three stand-alone class sessions with the instructor to provide students an opportunity to complete various forms of academic writing while giving them a connection to their field of study and the university. The unit culminates in a literature review based on research done by a professor at the university (see implementation guidelines below and appendix). After assessing the unit, students have felt proficient in research and writing for different audiences in their field.

About the Course

The unit of study is embedded in the First Year Experience Course for the college of engineering at Cal Poly Pomona. The course is for all engineering students but is open to all university students as it completes a general education area. As a general elective, the course meets the life-long learning requirement for students and seeks to engage students in the field of engineering, familiarize them with different areas of engineering and build foundational skills needed to be successful in college. There is a lecture and laboratory component for the course that are not co-requisite of each other and can be taken in any order. This unit of study is in the lecture portion of the class. Between lecture and laboratory, there are about 19 sections offered to serve the 956 first-year students in the college. The course is part of a larger university-wide effort to enroll students in first-year experience courses in their college.

Motivation- Curricular

The unit of study met various external demands on the curriculum: the university, college, and desires to standardize practice. The course this unit is completed during is under guidelines from the general education committee (lifelong learning), the first-year experience requirement, and is used by various departments as a beginning indicator for ABET. The course is to meet the following GE outcomes: Acquire foundational skills and capacities- Write effectively for various audiences; Develop capacities for continued development and lifelong learning- demonstrate activities, techniques, or behaviors that promote intellectual or cultural growth [1]. More importantly, the unit serves to grow consistency across the course and still maintain academic freedom for faculty and academic choice for students.

Motivation- Other

There were also other intangible factors that contributed to the development of the unit of study. Previous research [2,3] showed that students have high self-reported IL skills but are in fact

lacking in their academic ability; finding, evaluating, citing, and synthesizing information. Providing a way to link IL to the field makes it more relevant and worthwhile for students. This also is a way to support students in the development of their writing skills in a supportive, content-related way.

Objectives

Learning objectives for the collaboration between the engineering faculty and librarian included teaching the first-year engineering students information literacy skills; the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating in ethically in communities of learning [1]. In previous courses, it was found that students lacked these information literacy skills and needed far more than one library instruction session and one assignment to master these skills. It was determined that in order to accomplish these objectives, multiple library information literacy instruction sessions and information literacy-based assignments were necessary.

Implementation Guidelines

To prepare for the unit of study, the professor reached out to professors in each of the 11 engineering departments and conducted at least one interview with a faculty member about their research. These five-to-ten-minute conversations were recorded on zoom and posted for students to watch.

Table 1- Brief overview of lessons (see appendix for full lessons)

Week	Activity	Rationale
2	Meet with the engineering librarian to understand how to use the library and determine the quality of an academic article. Students follow the visit by finding a peer reviewed article on the topic of their choice in the field and apply the CRAAP test to the article.	Students become familiar with the library and library services as well as how to evaluate the quality of sources. Students demonstrate their understanding by evaluating a source.
4	Session with the engineering librarian 2, how to properly use IEEE citations and citation guidelines	Students learn how to use the IEEE style guidelines, how to properly cite resources and how to cite in text. Students also learn how to properly integrate resources in text.
6	How to write an abstract. Students learn about how to formulate an abstract and then write abstracts for published articles with abstracts removed.	To prepare for the annotated bibliography, students learn to summarize resources.
7	Session 3 with the engineering librarian, how to write an annotated bibliography. Students are then assigned an annotated bibliography on the topic of their choice- how their field works to support one of the 14 grand challenges.	Students learn how to write an annotated bibliography. Students learn to summarize resources (see above) and reflect on how to use them. Students can choose their own topic in their field to begin to see how their area of study impacts society.
10	Session 4 with the engineering librarian, how to write a literature review. Before this lesson, students watch all research videos and write short summaries, reacting with their interest. These videos serve as the research question for the literature reviews.	After watching the videos from faculty at the university, students choose a topic. Students learn how to write and formulate a literature review. Working with the engineering librarian and instructor, students formulate a research question, research plan and begin search.

10	What is the difference between a literature review and an annotated bibliography.	Students learn how the annotated bibliography and literature review work together. Students work to refine their research plan, and headings.
12	Session 5 with the engineering librarian, literature review follow up, what are you missing from your preliminary research and what have your colleagues found.	Students work in groups to discuss their resources and determine what the research question means to the field at large. Students refine their research and discuss collaboratively how to improve the literature review and next steps.

Assessment Methods

There are various direct and indirect measurements to assess student learning. A rubric was used to assess the annotated bibliography and literature review. These rubrics measured the proficiency level of students in synthesizing material, using proper IEEE formatting, and making coherent arguments. A short citation quiz gave an understanding of students' basic knowledge about IEEE formatting and the ability to read the style guide. Finally smaller assignments like the article analysis and abstracts provided the instructor guidance on reteaching. Indirectly, students were asked to complete a survey which found that students felt more comfortable with the research process, writing a research question and felt more connected to the field and university than those who did not participate in the unit.

Discussion

Based on previous work [3], we anticipated that students would find IL instruction more useful, since it is based in their area of study. What was unexpected was that students moved from the functional and social lenses for IL [2] to a personal academic lens for IL. Students overwhelmingly knew the importance of the IL and how it could help them reach their long-term academic goals. Many of the students reported that they are now considering undergraduate research and thinking about applying to graduate school at a higher rate than those who did not complete the unit of study. Narratively, a few students even mentioned changing their major to another field of study within engineering after being exposed to research they find interesting.

Unexpectedly, the professors who agreed to participate in the video portion of the unit found benefit in participating. Professors newer to the university were able to connect to students they were not previously able to connect with (students reached out for clarification and guidance). All professors who participated in the videos offered to read the literature reviews (since there were only a few on each topic) and connected with first year students interested in their research. Some have invited these students to join their research team.

This curricular unit was able to provide students with more confidence in their research ability, connection to the university and their field of study, and learn how to write various forms of academic papers for a variety of audiences.

References

[1] University Catalog, California State Polytechnic University Pomona, Pomona, CA , 2022.

[2] M. Gross and D. Latham, "What's skill got to do with it? Information literacy skills and self-views of ability among first-year college students," Journal of the American Society for Information Science and Technology, vol. 63, no. 3, pp. 574–583, 2011.

[3] J. O. Perez, and P.R. Hottinger, Complete evidence-based practice paper: The impact of information literacy instruction on the synthesis level of first-year engineering students. Presented at the 2020 ASEE Virtual Annual Conference. [Online]. Available: https://peer.asee.org/34316

Appendix

Finding and evaluating sources

After finding a PEER REVIEWED article about something in your field that you find interesting, please complete the following. Your answers do not have to be complete sentences but you should have enough information to support your claim that the resource you found is quality.

Criteria	Evidence/ discussion
C Currency The timeliness of the information	
R Relevance The importance of the information for your needs	
A Authority The source of the information	
A Accuracy The reliability, truthfulness and correctness of the content	
P Purpose The reason the information exists	

You may want to reference what the librarian showed us:
https://libguides.library.cpp.edu/c.php?g=962200&p=7216748

Sample IEEE assessment questions

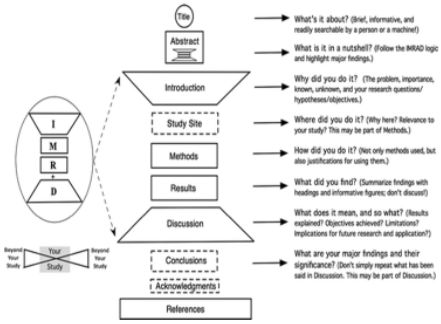
1- Which is the proper format?
A) ."[13]
B) .[13]"
C) [13]."
D) "[13].
2- How should your reference list be ordered?
A) In the order they are referenced in the paper
B) Chronologically, most recent to oldest
C) Alphabetical
D) by types- books, then journals, then digital...
3- Which part of your paper should be bold?
A) The conclusion
B) The abstract
C) None of it
D) The references

Sample slides: What is an abstract

Parts of an Abstract

- **I- Intro**
  - Overview of the background and paper (25%)
- **M- Materials and Methods**
  - What you did and how you did it (25%)
- **R- results**
  - What you found out (35%)
- **D- Discussion**
  - What it means (15%)

Values in red are one option. There is no set rule



https://link.springer.com/article/10.1007/s10980-011-9674-3

Find the different sections of the abstract. Underline the intro, circle the materials and methods, put a line above the results and put a wavy line under the discussion

In the current environmentally constrained context, deploying effective environmental regulations (ERs) to promote greener technologies is necessary. Green technology innovation efficiency (GTIE) reflects the efficiency of an industry's use of resources in the green technology innovation process. However, previous research has considered innovation as a black box regarding the potential contribution and diversity of ERs. In order to analyze the differential impacts of ERs on GTIE, this study classifies ERs into command-and-control, marketbased and voluntary. By adopting China's 2000–2017 construction industry as a case study, this study analyzes GTIE evolution based on a network Epsilon Based Measure (EBM) model and analyze the impacts of ERs by Tobit Regression. Findings suggest that: (1) There is a significant disconnection between the Research & Development (R&D) and commercial application stages of green technology in construction industry. The construction industry is able to turn most R&D achievements into profits at the commercialization stage, but a large amount of R&D investment does not produce R&D achievements. (2) Different types of ERs have different impacts on GTIE, but their intended outcomes can only be achieved by a suitable combination of them.

[1]F. Ye, Y. Quan, Y. He, and X. Lin, "The impact of government preferences and environmental regulations on green development of China's marine economy," Environmental Impact Assessment Review, vol. 87, p. 106522, Mar. 2021, doi: 10.1016/j.eiar.2020.106522.

Find the different sections of the abstract. Underline the intro, circle the materials and methods, put a line above the results and put a wavy line under the discussion

This study explores the impact of Technology-Assisted Supplemental Instruction (TASI) on the sense of belonging and academic achievement of URM identified students in Statics courses at a large public HSI university. TASI is a peer-led tutoring service in partnership with faculty support that targets high failure rate STEM courses, in this case, three different iterations of Statics. Students completed four surveys that measured demographics, sense of belonging in their field of study, and confidence in their ability to do well in their courses. In addition, TASI attendance, students' academic and enrollment data were collected. Preliminary belonging data at the beginning of the term showed the nearly 80% of Latinx students agreed with the statements: "I sometimes feel like other students in my field of study have skills that I do not," and "When I struggle in a class I feel that I don't belong in the field". Linear regression also shows that the main predictor of student grades in Statics are identifying as a URM student or Pell recipient. TASI has the goal of increasing academic support and therefore performance to alleviate these feelings and ensure student persistence. Using matched pairs analysis, the data shows a statistically significant increase of 0.4 to 0.5 in course grade on a 4-point scale. These results were most apparent in URM students. The rate of failing grades for URM students decreased up to twenty percent (depending on the section). The impact of the TASI is more evident for students of color during the COVID pandemic and virtual learning. The use of an anti-deficit lens highlights how imperative it is to have meaningful, useful, and accessible interventions. Student facilitators, access, and awareness of programs are noted as crucial to success.

[1]
J. Perez, F. Wachs, H. Nguyen, B. Jones, and D. Miranda, "Supplemental Instruction to Decrease Equity Gaps in Gate-Keeper Engineering Courses," in *ASEE National Conference*, Jun. 2022.

Annotated Bibliography Assignment

After listening to the engineering librarian and consulting the IEEE style guide provided, students will complete an annotated bibliography on a topic of their choosing connected to one of the 14 grand challenges and a research question already formulated.

Students are asked to use their information literacy skills to find and analyze at least six (6) academic, peer reviewed, appropriate sources related to their research topic. The annotated bibliography will summarize each article, critique the methods and findings of each study and should include a short statement on how the source can be used in a formal review of literature.

Each entry will begin with a full IEEE citation of the source.

An excellent place to begin on an annotated bibliography is:

https://guides.library.cornell.edu/annotatedbibliography/home Olin Library Reference, Research & Learning Services, Cornell University Library, Ithaca, NY, USA

or you can find some samples of entries at:
https://owl.purdue.edu/owl/general_writing/common_writing_assignments/annotated_bibliographies/annotated_bibliography_samples.html

The IEEE Style guide can be found on the CPP library home page under engineering
http://libguides.library.cpp.edu/c.php?g=327086&p=2194939

http://libguides.library.cpp.edu/egr1000

ASSIGNMENTS WILL BE DUE:

Annotated Bibliography Rubric

	0	1	2	3
Citation	There is no citation or it is completely incorrect.	The citation is not proper IEEE formatted. There are errors or/ and there is missing information.	Work is correctly cited with proper IEEE formatting with only one or two minor errors.	The work is cited correctly in IEEE formatting and has no errors.
Summary of Sources	Sources are not effectively summarized.	The main argument of the source is not clearly stated, unclear or inaccurate. No details are given or too many details are given.	The source is summarized and the main argument is clearly stated. Some details are included.	The source is clearly, accurately, and concisely summarized. The main argument of the sources is clearly stated and only important information and details are included.

Analysis of Sources	There is no analysis of the source	Annotation fails to mention an important aspect of the source's methods, discipline etc. and/or does not in any way assess its quality or usefulness	Annotation discusses at least one significant aspect of the methodology, disciplinary perspective, types of evidence or audience of the source. Its strengths or weaknesses are mentioned and how it might be useful or limited	Annotation concisely discusses several significant aspects the methodology, disciplinary perspective, types of evidence or audience of the source. Its strengths or weaknesses are mentioned and how it might be useful or limited.
Quality of Sources	The source is not reliable, credible or substantial	The source lacks credibility or is not substantial enough to be useful to a scholarly investigation	The source is reliable. It contains at least one demonstrably useful form of information for a scholarly investigation of the topic.	The source is reliable , credible and substantial and clearly would provide useful information on the topic for a scholarly investigation.
Style and Technical correctness: paragraphs etc.	The paper is very difficult to read and does not make sense due to technical errors. Formatting is not present or there are no headings.	There are many technical errors that interfere with the clarity and coherence of the paper. There are serious errors in the formatting (IEEE) of the paper and headings	There is effort to integrate the elements of the annotation. There are some minor errors but they do not interfere much with the clarity. The paper has been proofread and is correctly formatted and includes all important information.	Elements of the annotation are smoothly integrated so it reads as a whole. The paper is mostly technically correct, clear and coherent, with few minor errors in grammar, spelling etc. The paper has been carefully proofread.

VIDEO PROMPTS BEFORE LITERATURE

Gathering research questions.

Below are the links for various short (less than 15 minutes each) research talks from professors active in research at CPP. Please listen to EACH (even if it is not your field). After listening to each talk write a brief summary of each. Here are a few prompts you can use to start your summaries: What is the research question? What is compelling about the research? Do I find it interesting? Why is the research important?

FK: EE https://youtu.be/ G L: CE https://youtu.be/ K F: CHE https://youtu.be/ N T: MEhttps://youtu.be/

SF: IE https://youtu.be/ ZS: AE https://youtu.be/ DH: ManEhttps://youtu.be/ PA: ET https://youtu.be/

Literature Review EGR 1000- Engineering Society and You

EGR 1000 course Description: The development of the individual in society from an engineering perspective. The study of the integration of society and technology. Development includes introduction to the fields of engineering and engineering technology, career planning, development of a community of learners, critical thinking, problem solving skills for lifelong learning, and ethical and professional behavior. (CPP College of Engineering "First Year Experience" 2017)

ABET Student Outcomes:

(3) Communicate Effectively

(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (ABET “Student Outcomes”, 2019)

This paper is meant to connect students to research in their field, the university, and to learn how to synthesize information in a literature review. This issue can be of the student’s choice from the topics presented in videos by faculty. Not to be confused with a book review, a literature review surveys scholarly articles, books and other sources (e.g. dissertations, conference proceedings) relevant to a particular issue, area of research, or theory, providing a description, summary, and critical evaluation of each work. The purpose is to offer an overview of significant literature published on a topic. (https://guides.library.ucsc.edu/write-a-literature-review).

To be considered complete the paper must:

1. Address all parts of the prompt
2. Be original work
3. Use proper IEEE formatting
4. Include AT LEAST 6 reliable references (5 independent and one from a peer)
5. Have a length of AT LEAST 6 pages
6. Include a cover page and reference page (not counted in page count)

The paper will contain the following sections: I: Overview and Significance; II: Research Question; III: Literature (with synthesis and discussion); IV: Conclusion (how will research contribute to literature- how does it move the field forward)

Proper IEEE formatting

https://www.ieee.org/documents/style_manual.pdf
http://pitt.libguides.com/ld.php?content_id=403129
https://www.ieee.org/conferences_events/conferences/publishing/style_references_manual.pdf

References

"First Year Experience." College of Engineering, California State Polytechnic University, Pomona, 2017, www.cpp.edu/~engineering/academics/firstyear.shtml.

"Student Outcomes, Criteria for Accrediting Engineering Programs 2019-2020." ABET, Maryland, 2019 https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2019-2020/#GC3.

Part 2 literature review: Dialectical journal

Students will keep a dialectical research journal throughout the course of their project. This is a two-column reaction journal to keep track of your thinking while you are doing research. This should not be confused with the annotated bibliography done previously in the semester. The annotated bibliography was a way to gather and summarize research literature. The purpose of the dialectical journal is to think about your thinking and level of understanding while reading.

At the end of the journal, students will write a reflection about their topic.

Topic	My Reaction
Citation of literature and brief description of the research	Include: How this is connected to other sources What makes this literature interesting How the piece relates to the current research What the literature makes me think about What else I need to understand before I can analyze the literature ANYTHING else you want to include
Reflection: Your reflection about your research should include the following: • What you found the most frustrating about the research process • What you found the most interesting about the research process • How you worked in groups with peers • How you worked independently • Did you find connection to the field? A professor at the university?	