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Integration of Information Literacy Skills to Mechanical Engineering Capstone Projects

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Integration of Information Literacy to Mechanical Engineering Capstone Projects

1. Abstract

Searching for information and using that information appropriately is an essential part of every engineering design project. It has been reported that design engineers spend about 30% of their time searching for information. Experience shows that even senior level students have not received proper training, either directly or indirectly, in information literacy (IL). They usually search for information intuitively. For mechanical and aerospace engineering students at West Virginia University Institute of Technology (WVU Tech), the Mechanical Engineering System Design I and II courses (MAE 480 and 481) are probably the last chance to teach students about IL. In this project, the information literacy outcomes were added to the course syllabus and activities and assignments were designed to instruct and evaluate IL- related skills. Three librarians from West Virginia University and WVU Tech were integrated into this course, each of which provided a workshop to present different IL skills to the students. The students' feedback and course evaluation tools have confirmed an improvement in the IL related skills in the students.

2. Introduction

The instructor conducted a survey in his classes querying: "How many times a semester do you go to the library?" About 70% answered less than once a semester. When students were asked "When was the last time you went to the library?" the average answer was approximately 3 months ago. In the majority of the courses the instructor teaches, students are required to conduct some sort of literature review related to the course topic. When queried for the first step for information gathering, the students almost always answer "Google it!" or in the best case "Find the related article in Wikipedia!" The other side of the problem is that students do not know how to properly acknowledge others' work.

It is ironic that in the so called "information age", we have an "information literacy crisis". The objective of this project was to add components to the Mechanical Engineering program that would address these fundamental problems in the engineering curriculum.

Currently, there is an immense expansion and broadening of knowledge in science and engineering. Every branch of engineering is divided into so many subdivisions that it is impossible for an individual to be expert in all of them. This phenomenon has created many interdisciplinary projects that involve many diverse fields. That means occasionally, one needs to be informed and even an expert on various subjects outside his or her direct expertise.

On the other side, the digital age has a profound impact on the available resources for everyone, including engineers. Between 2009 and 2011, the amount of online information created or replicated grew by a factor of nine [1]. This abundance of information has changed the way we search, evaluate, and use information.

2.1. What is information literacy (IL)?

The National Forum on Information Literacy's mission is "to mainstream information literacy philosophy and practices throughout every sector of American society" [2], and defines information literacy as "…the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information" [3] to solve problems in professional and daily life. In 2006, the ALA/ACRL/STS Task Force on Information Literacy for Science and Technology created Information Literacy Standards [4] for Science and Engineering/Technology. These standards guided the librarians involved in this project.

In this project, information literacy is defined as the ability to:

- search and find relevant information on interested topics from diverse resources;
- evaluate the quality and validity of sources;
- apply information critically to the research/project of interest;
- cite the references properly.

2.2. Importance of information literacy for engineers in general and design engineers in particular

The multidisciplinary nature of engineering in 21st century makes it impossible for anyone to be an expert in all fields that she/he is supposed to work on. Engineers must look for information on a daily basis. This information need is more critical in design projects where engineers deal with a wide variety of information at various steps of a project. Time constraints imposed on the design team as well the need for diverse information challenges design engineers. Diverse information ranges from abstract ideas in the conceptual design step to the smallest details in the detailed design, from checking patents for new ideas to avoid any infringing of existing patents and trade names. Because of this need, the ABET (Accreditation Board for Engineering and Technology) has articulated the importance of student outcomes to include "(f) an understanding of professional and ethical responsibility", and "(i) a recognition of the need for, and an ability to engage in life-long learning." [5]

Design information takes on various forms other than written form, e.g. drawings, spreadsheets, graphical communications, numerical models, physical models, and prototypes and can heavily depend on the design engineer's personal collection of design information.

In an ASME conference paper (Lowe et al), it is reported that design engineers spend 30% of their time searching for information [6]. Therefore, the importance of IL for design engineers is self-evident.

2.3. The "Google" Issue

Since students turn initially to Google or another search engine, the information that students retrieve during a Google search must be addressed. Students must be taught that using search engines without source evaluation is not the best way to search for information needed by a design engineer. Since many of the retrieved sources using this method are not peer-reviewed or supervised by the editorial teams, the correctness and credibility of information is questionable. Also, how up-to-date the data are, their objectivity, and how unbiased they are should be Evaluated carefully. Furthermore, volatility of websites is always a problem because as soon as they disappear, which can occur very often, they are not citable.

2.4. Information Literacy Course Enhancement Program

The information literacy course enhancement program at WVU is an initiative sponsored by the WVU Libraries and the Office of the Provost. The objective of the program is to insert information literacy skill throughout a course, thus stimulating students to develop new research strategies and capabilities. The students learn to think critically about what and how they search for information, become more discriminating about the sources they use, and become more aware of ethical and legal ways of using information.

3. Integration of IL into the Mechanical Engineering Program Capstone Project

Experience shows that even senior level students have not received proper training, either directly or indirectly, in information literacy. They usually search for information intuitively. The Mechanical Engineering System Design I and II courses (MAE 480 and 481) are probably the students' last opportunity to be taught about IL. In order to integrate IL to Mechanical Engineering System Design I and II, the following learning objectives have been added to the course syllabus:

Learning Outcome Related to the Information Literacy

1. *Search online information using the tools and techniques learned in the class.*
2. *Locate more traditional technical and engineering resources.*
3. *Evaluate the validity of resources.*
4. *Apply critical thinking to choose relevant sources to use in the project.*
5. *Use the information legally.*
6. *Cite the used information ethically.*
7. *Apply the knowledge learned in this class in other courses and as a tool for lifelong learning.*

By the end of the program, students are expected to be able to:

- Identify information needs;
  - Various types of information sources:
    - Primary vs. secondary information,
    - Peer-reviewed vs. non-peer-reviewed sources,
    - Scholarly vs. popular sources,
    - Journals vs. magazines,
    - Databases vs. internet;
  - Keyword search vs. field search;
  - Abstracts vs. full texts;
  - Library of Congress Subject Headings;
  - Boolean concepts;
  - Trade literature.
- Access information from diverse sources;
  - Public library;
  - WVU library;
  - Vining library at WVU Tech.
- Search online information using the tools and techniques learned in the class:

    - Google,
    - Other search engines;
- Locate more traditional technical and engineering resources;
    - Government resources;
    - Patents;
    - Interlibrary Loan Service.
- Evaluate quality and validity of sources according to;
    - **A**uthority;
    - **B**ias;
    - **C**urrentness;
    - **D**ocumentation.
- Apply information critically, legally, and ethically to produce new knowledge;
    - How to avoid plagiarism;
    - Why and how to cite;
    - Various citation styles (APA, MLA, ASME, and IEEE);
    - Concept of common knowledge;
    - Concept of fair use of copyrighted material.
- Identify intellectual properties:
    - Patents,
    - Copyright,
    - Trademark.
- Communicate new knowledge in various forms.
- Apply learned skills as tools for lifelong learning.

IL is particularly important in the literature review and information gathering phase of projects. Several workshops related to IL have been offered to the students while at this institution. Participation in these workshops and completing their requirements are mandatory.

The IL portion of the course has been evaluated through the following activities:

- Students' ability to apply the skills they learned in their written reports (proposal, interim report, final report, and weekly progress reports).
- Assignments related to IL.
- After initial period of the class when all teams select their project and post a source of information related to the project in a blackboard Discussion Board. The other students evaluate the source in term of its validity and trustworthiness. The instructor also evaluates the source. The grade will be based on how far student assessment is from the instructor's.
- Surveys are administered in the beginning, at the end of the semester and several times during the term to evaluate student skills related to IL.

In the rest of this manuscript the activities implemented to achieve the learning outcomes and to evaluate student learning will be presented.

3.1. Execution

The purpose/goal of information literacy instruction is to help students to think like a

designer/researcher when they are in the discovery phase. To achieve this goal, the following actions have been planned and executed:

- Integrating three librarians into the course to form an instructional team;
- Students spending more time in the library;
- Out-of-class time for student-librarian face-to-face meetings;
- Preparing search strategies;
- Completing the plagiarism avoidance online tutorial and quiz;
- Completing pre- and post-tests.
- Two of the three librarians were WVU Engineering Librarians from Morgantown and third one was from the Vining Library at WVU Tech:
    - Each prepared 1.25 hr lectures.
    - Two visited the class in person.
    - One visited via ooVoo (videoconferencing similar to Skype).
- The two WVU Librarians prepared two Research Guides to assist students, based on what was available to them from WVU Tech.

Next, the IL process is revisited with demonstrations of how it is applicable to engineering and design. It is very important to remember that in the engineering design process what is needed is sufficient information to make an intelligent design decision, no more, no less.

4. Finding and retrieving information effectively

The professor and librarians developed each class session in a way to provide students with effective strategies to find the required information. It was assumed that the students needed to build on IL fundamentals, looking at broader and introductory information before moving on to the process used to retrieve more focused and detailed information as they had a better grasp and understanding of each topic.

4.1. Library resources

Based on this strategy students looked at progressively more detailed works:

- Technical dictionaries: to learn terminology.
- Technical encyclopedias: to get quick and brief information.
- Textbooks: to access comprehensive information on a broad topic.
- Monographs: to access comprehensive information on a narrow focused topic.
- Handbooks: to access complete set of information on a specific topic.
- Technical journals: to explore the results of latest research.

The students' choices in each of these areas were limited to what the campus had access to and information that was freely available on the Internet

4.1.1. Assignments

Based on the premise of beginning with a very broad topic and learning the strategies needed to become more focused, students were asked to work on the following assignments to master each skill to find information through the library:

- *Find a technical dictionary and search for the meaning of at least 10 words related to your project. Report the words and their meaning (with the copy of one page).*

- *Find a technical encyclopedia and find at least two parts related to your project. Hand in the copy of one page.*
- *Locate two monographs related to your project, one that is available in the library and one that is not available. Use interlibrary loan service to get the one that is not available in the library. Bring both books to the class.*
- *Locate all handbooks related to your project. List them and try to get access to them. If they are not in the library, ask a librarian to help you to get access to them.*
- *Find as many review papers as you can related to your project in technical journals using one of the indexing and abstracting services. Print one of them and hand it in to the instructor.*
- *Find two patents related to your project.*

4.2. Online resources

Appropriate online resources can be divided into two groups: those available through the university's library and those publicly available. Because Internet searching is ubiquitous in student learning today, a search engine assignment was introduced. The students needed to understand and effectively use the sources available to them at this time. The expectation was that each student could apply these steps as a more diverse set of data became available in the future.

4.2.1. Search engines

For most people, the word search engine is equivalent to "Google", but there are so many other options. It is important to understand how the search engine that one is using locates information and more importantly, how it ranks information. To help students familiarize themselves with various online search engines, students were asked to do an assignment, prepare a report, and present their findings in a short presentation. (see Appendix A).

4.3. Other sources

Some of the other sources of information that can be accessed either through libraries or through online sources are as follows:

- Student theses
- Patents
- Business information (brochures, catalogs, etc.)
- Trade magazine
- Conference proceeding
- Technical reports
- Government resources
- Scientific journals

4.3.1. Scientific journals vs. trade magazines vs. conference proceedings

Scientific journals present results of the latest research which may be far away from commercial applications. But trade magazines present latest practices in a specific field which usually have more practical applications in daily engineering practices. Conference proceedings are usually

considered to be less valuable in terms of scientific merit, but in fact many companies do not like to publish their papers in journals but prefer to present them in conferences.

4.3.2. Assignments

Students have been asked to work on the following assignments to master the skill to locate useful information through above-mentioned sources:

- *Identify a trade magazine related to your project and find how you can subscribe to the journal.*
- *Identify a technical conference related to your project. Find where and when the next conference is.*
- *Find a student thesis related to your project. Ask a librarian how you can get access to the thesis.*
- *Most engineers keep a collection of brochures, catalogs, etc. related to their field. Find at least five vendors that you can purchase items related to your project (Thomas Register of American Manufacturers www.thomasnet.com is a good starting point). Collect their brochures and catalogs and keep then in your project folder. If they are not available online, get in touch with the sales department of the company.*
- *The best place to look for the manufacturers are trade magazines and trade shows. Find a trade magazine related to you project and copy an advertisement of vendor/manufacturer related to your project.*
- *Also, locate the next trade show related to your project (where and when).*

4.4. Government resources

Information presented through government resources is so vast, diverse, and usually neglected that it requires a separate section. About 35% of R&D activities in the US is sponsored by the federal government [7]. This is a huge source of information that is severely underutilized. Some of these resources are presented in the following sections [7]. Several agencies were introduced so that students could become familiar with important government resources. These resources included the GPO, NTIS, OSTI.

4.4.1. Government Printing Office, GPO (http://www.gpo.gov/fdsys/)

The professor and librarians emphasized resources at the GPO, including government budget information; federal regulations, laws, and codes; congressional and senate documents; economic and education reports; and many other non-technical collections.

4.4.2. National Technical Information Service, NTIS (http://www.ntis.gov)

Because of NTIS's (a division of U.S Department of Commerce) detailed technical information, this agency was highlighted. Its wide range of technical information from agriculture to business and from energy and environment to space and ocean technologies is available for a nominal fee.

4.4.3. Office of Scientific & Technical Information, OSTI (http://www.osti.gov)

Additionally introduced was OSTI's SciTech Connect database (a division of U.S Department of Energy, DOE) because of its technical information related and/or sponsored by DOE.

4.4.4. Assignments

Students were required to search GPO, NTIS, and OSTI databases to find information related to their projects, choosing three most related documents and describing their usefulness for the students' projects. Additionally students were asked to determine the North American Industry Classification System (NAICS) codes related to their projects.

5. Evaluate validity of information

Once students have used the appropriate sources to find information related to their topic, they must then be given a guide to evaluate these sources for their effectiveness in regards to the project's purpose and information's credibility. One of the librarians presented an option to use for evaluating information sources. The ABCD process was adapted from a pneumonic that was used at Harvard University Libraries. The "A" represents Authority---who provided the information and what is the affiliation of the person. "B" represents bias. Is it obvious that the creator has a specific point of view or is there an effort to represent the entire picture? Bias is not necessarily bad, but must be recognized and used properly in the project. "C" stands for how current the item is. If recent information is required on a topic, something from 1975 probably will not be adequate. Students were asked to look for evidence that the site is regularly updated. Finally, "D" is for documentation. Is there a bibliography or any indication what kind of research was done to produce the information? Students were advised that all print, spoken, and electronic information should be looked at with a critical eye to determine its fit for their projects.

6. Apply information critically

The result of information gathering is most likely data that need to be processed to become information and then evaluated to become knowledge and then communicated [7].

Gathering data and information is a very important step in engineering design. In fact, surveys of design engineers indicated that they spend up to 30% of their time gathering data and information [7]. Data and information gathering can consist of facts, data, and/or other people's opinion. Data should be processed to convert them to information using processes to make the data meaningful. This conversion can be done by statistical and numerical analysis, identifying scope and conditions of the data, or categorizing and summarizing them. This conversion step can be highly computerized. Once data are converted to information and information is gathered these pieces must be converted into knowledge in order to be useful. Only humans create knowledge through using comparison, evaluating consequences, looking at connections and discussion the information with others [7].

The importance of peer review was explained to the students. Students need to understand that information should be evaluated and judged by experts by considering the reasons and results of the existing information. Students must learn to compare them with other information, and place the existing information into the larger picture. Students must also understand that several people or a panel read the research to verify that the analysis.

7. Using information legally

Intellectual Property (IP), Trade Secrets, Copyright, Trademarks and Patents, were introduced to the students in the context of the students' current and future use of IP. In the future as

engineers, students will need to know that companies often retain intellectual property rights even when developed by individual engineers, and trade secrets can be closely guarded with non-disclosure agreements.

Students also need to know what can be used under "Fair Use" and public domain as well as common knowledge. Especially important for fair use are four factors, which were explained. The use of text and drawings of a patent in a report was discussed with emphasis on the public domain concurrent with citation (to avoid plagiarism).

Intellectual property protection is covered in the first article of the U.S. Constitution. Other laws followed. In class each type of intellectual property was introduced but patents were especially emphasized. The patent process as well as patent searching were introduced. The CPC (Cooperative Patent Classification) was introduced as well as the USPC (U.S. Patent Classification). The CPC on Espacenet was emphasized because of the ease of comprehension of a tree-logic structure for engineers. (The CPC has been adopted by both the U.S. and European Patent Offices.) These classification searches assist inventors in searching prior art to determine what has previously been patented. Students will be able to use these search techniques with their current MAE 480 and 481 projects as well as in the future as engineers.

8. Using information ethically

In this section the students were instructed on how to use other people's work and avoid plagiarism.

The librarians informed the students of the importance of proper citations in their papers and the acknowledgement the authors of works in writing a paper and conducting the research. The importance of relocating information through citations and footnotes as well as giving credit to other others was stressed. Good citations allow readers to find the information used to create the paper. The concept of plagiarism was covered as well as the serious consequences in academic circles. Students were helped to see that proper credit and citations help to avoid any hint of plagiarism. Additionally, finding and using appropriate information ensure the creation of a better product, whether that product is a paper, machine, or software.

The students were able to implement much of what they learned as they practiced with various methods of communications of the results of a project, including writing reports, giving presentations and creating a poster.

9. Evaluation of student learning from the program

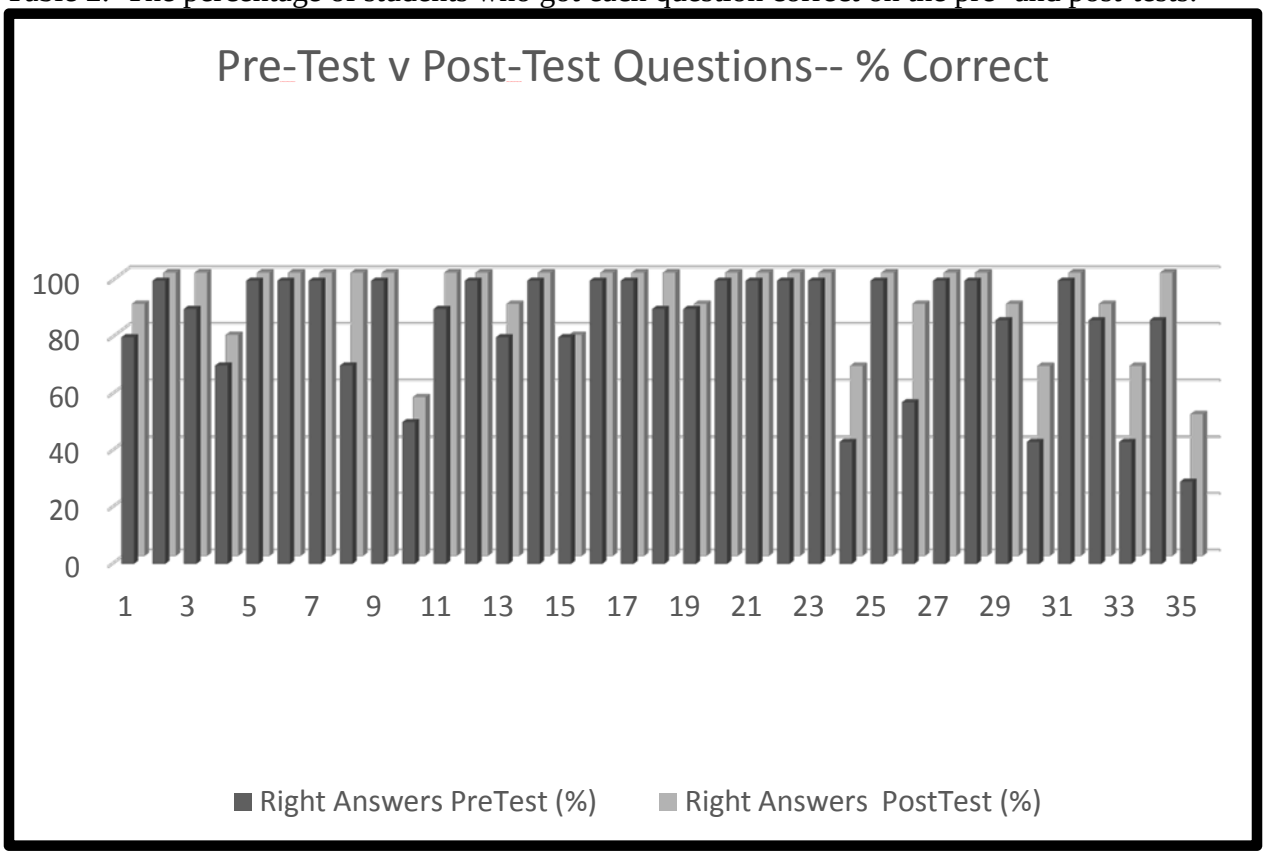
The students were administered a pre- and post-test in order to evaluate student learning from the information sessions. The questions are found in Appendix B. The results, shown on Table 1 on the next page, indicate that before the class students understood about 50% of the concepts. In the areas where less knowledge was apparent, most saw an increase in knowledge.

Table 1. Percent change in correct answers selected from pre- to post-test

Question Number	Right Answers Pre-Test (%)	Right Answers Post-Test (%)
1	80	89
2	100	100
3	90	100
4	70	78
5	100	100
6	100	100
7	100	100
8	70	100
9	100	100
10	50	56
11	90	100
12	100	100
13	80	89
14	100	100
15	80	78
16	100	100
17	100	100
18	90	100
19	90	89
20	100	100
21	100	100
22	100	100
23	100	100
24	43	67
25	100	100
26	57	89
27	100	100
28	100	100
29	86	89
30	43	67
31	100	100
32	86	89
33	43	67
34	86	100
35	29	50

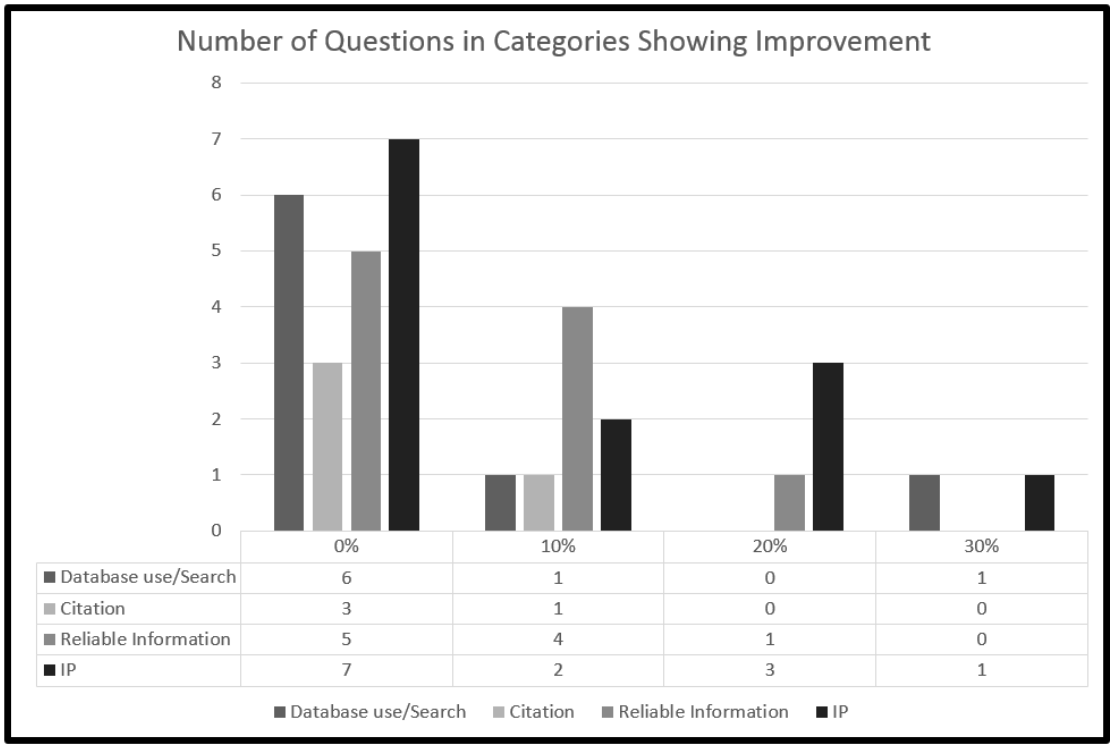
Since students are seniors they do have some basic knowledge of Information Literacy. This can be seen in Questions 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16, 17, 19, 20, 21, 22, 23, 25, 27, 28, and 31 More detailed knowledge was learned as demonstrated by questions 8, 24, 26, 30, 33, and 35.

Table 2. The percentage of students who got each question correct on the pre- and post-tests.



The questions can be divided up into four major categories: Database Use/Searching, Proper Citations, Reliable/Appropriate Information, and Intellectual Property Related Information. When examining the results broken down by category, one can see that the most significant improvement was in the areas of Intellectual Property, Database Use and Reliable Information. (See Table 3).

Table 3. Improvement in answers to questions by category, with 0% indicating no improvement between the pre- and post- tests



	0%	10%	20%	30%
Database use/Search	6	1	0	1
Citation	3	1	0	0
Reliable Information	5	4	1	0
IP	7	2	3	1

Student feedback

Students provided feedback on the librarians' sessions which included comments as well as a self-evaluation. Students primarily commented about their intellectual property learning stated
"The presentation by the WVU librarian was complete and helped me understand contents of patents that didn't understand before. As this is part of designing, this presentation completed the class program." Another students indicated that "Great information [was] covered during the intellectual property conference." An additional student specified that he, "learned a lot about trademarks and copyrights I didn't know."

When students self-evaluated their learning out-comes, they felt that they had learned not only how to locate and use the most appropriate tools and resources for their research/design projects but also how to use that information both legally and ethically. All of these outcomes contribute to students becoming lifelong learners.

Table 4. Students' Self-Evaluation of Learning Outcomes (out of 10)

Student learning outcome	Out of 10
Search online information using the tools and techniques learned in the class	9.25
Locate more traditional technical and engineering resources.	9.25
Evaluate the validity of resources.	9.25
Apply critical thinking to choose relevant sources to use in the project.	9.25
Use the information legally.	9.5
Cite the used information ethically.	9.5
Apply the knowledge learned in this class in other courses and as a tool for lifelong learning.	9.375

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Appendix A

Assignment on search engines

Select a search engine other than Google and send it to the instructor. After his approval, evaluate and test the engine to answer the following questions. The questions are answered for Google here. Compare your answers with these results. You may wish to get the most updated data from Google for the comparison.

Q: Name of the engine:
Answer for Google: Google.com

Q: When was it introduced to public?
Answer for Google: 1997

Q: How does it work?
Answer for Google: The engine search information that was indexed by a crawler.

Q: How the results are ranked?
Answer for Google: The rank of each page is determined based on the number of web pages that linked to a particular web page. However, there are so many other criteria that are secret.

Q: How many special features does it provide beyond search engine?
Answer for Google: so many services and counting (please check the website for the latest services).
Q: Search for the term fuel cell. How many responses did you receive? Interpret your answer. How long did it take?
Answer for Google: About 70,700,000 results, 0.31 seconds. It means this many web pages contain both fuel and cell in any order and any places in the web page (this is evident in the URL of the page where term =fuel+cell appear). Note that this number can change very rapidly. When the search was repeated after 15 minutes, the number of responses increased to 87,000,000.

Q: Find out how you can search for the exact phrase fuel cell? How many responses did you receive this time?
Answer for Google: Search for this term "fuel cell". This will narrow down the search and reduces the number of results significantly to about 9,610,000 results.

Q: Find out how you can search for either phrases fuel or cell? How many responses did you receive this time?
Answer for Google: Search for this term fuel or cell. This will make the search broader and increases the number of results significantly to about 250,000,000 results.

Q: Find how you can exclude a term from search. In this example, we are only looking for information on low and medium temperature fuel cell. Exclude the term high temperature from search for "fuel cell", how many responses did you receive this time?

Answer for Google: Search for this term "fuel cell"- high -temperature. This will narrow down the search and reduces the number of results to about 10,500,000 results (which by the way does not make sense because the number of results should reduce or at least remain unchanged).

Q: Does the engine have the advanced search option? If so, how can you perform all these operations in the advanced search?
Answer for Google: Yes, Google has the advanced search option and you perform all above mentioned tasks by adding phrases to the following boxes:

- *all these words,*
- *this exact word or phrase,*
- *any of these words,*
- *none of these words.*

Q: Can you limit the following criteria in the advanced search? If so, set the criterion to the given value and report the number of responses when you search for "fuel cell".

Q: Language: English
Answer for Google: About 29,600,000 results (does not make sense again).

Q: Region: United States
Answer for Google: About 19,000,000 results (does not make sense again).

Q: Last update: past year
Answer for Google: About 11,700,000 results (does not make sense again).

Q: Site or domain (search certain site or domain): domain edu
Answer for Google: About 151,000 results.
Q: Terms appearing: in the title of the page
Answer for Google: About 678,000 results.

Q: Reading level: only advance results.
Answer for Google: About 1,900,000 results.

Q: File type: PDF
Answer for Google: About 665,000 results.

Q: As it is obvious, none of the above criterion limited the number of results to a reasonable level. Now try to set all the criteria in the advanced search page as listed above. How many responses did you receive this time?
Answer for Google: About 27 results.

Appendix B

List of questions:

1. Which of the following is for a peer-reviewed (scholarly) periodical?
a) Journal of Fuel Cell Science & Technology
b) Popular Mechanics
c) Wall St. Journal
d) Smithsonian Magazine

2. Why is it important to provide proper citations in your papers?
a) To avoid plagiarism
b) To give the author(s) proper credit for their work
c) To prove that your work has a solid, scholarly basis
d) All of the above

3. If looking for research on solar energy panels, which search statement would give the most focused results?
a) solar energy AND panels
b) solar energy panels
c) "solar energy panels"
d) All options would work equally well

4. When is it appropriate to use Google Scholar to search for research papers or books?

5. Which statement is NOT true about reliable information?
a) It can always be found in Wikipedia
b) It helps engineers produce safe, healthy products
c) Using reliable information the first time saves time and effort
d) Reliable information helps produce a better product

6. You are allowed to use a table from a book or article without citing the source.
a) True
b) False

7. Copying and pasting from the Internet can be done without citing the Internet page, because everything on the Internet is common knowledge and can be used without citation.
a) True
b) False

8. If your professor wants your research to be based on only scholarly and/or peer reviewed sources, which of the places below would be appropriate for you to use?
a) Bing
b) Academic Search Complete
c) ASME Digital Collection

d) SciTech Connect
e) All but Bing
f) All but SciTech Connect
g) All but ASME Digital Library
h) All but Academic Search Complete

9. A good place to find articles for a mechanical engineering topic is Academic Search Complete, as long as you limit to the search to peer-reviewed (scholarly) journals.
a) True
b) False

10. When evaluating a resource, which is NOT a reason for selecting the resource for an engineering paper or project?
a) Author affiliation
b) Featured as a cover article in Popular Mechanics
c) Includes a list of references to items consulted
d) Site appears to be up-to-date

11. Why is it important to use a consistent style (APA, MLA, etc) when creating citations for your papers and reports?
a) Using a consistent style makes the citations easier to understand
b) A consistent style insures you will not forget to include important information
c) It is important that you use the correct publication style so your paper publication is not delayed
d) All of the above.

12. Engineers are expected to have high standards for themselves and the work/product they produce. Using information that is reliable and citing it properly is an example of following engineering ethics.
a) True
b) False

13. Which of the following is NOT a relevant site to use for engineering research?
a) SciTech Connect
b) NTIS
c) Directory of Open Access Journals
d) All are appropriate sites to use for engineering research

14. It is always a good idea to become familiar with the search features in a database or website because it will save you time and get you to the information focused on your topic.
a) True
b) False

15. Google Scholar will always get you access to the scholarly articles paid for and make accessible by my library.

a) True
b) False

16. Why should you be skeptical of information on the Internet until you have verified its reliability?

17. A patent is a property right granted to an inventor to exclude others from making, using, offering for sale, or selling the invention.
a) True
b) False

18. Intellectual Property laws are in place to:
a) Define intellectual creations that are entitle to protection
b) Define how to obtain or lose intellectual property rights
c) Define how to obtain enforcement and compensation when the rights are violated
d) All of the above

19. Trademarks are directed toward the protection of:
a) Musical composition
b) Software
c) Manufacturer's or service provider's goodwill and reputation
d) Book or manuscript

20. Books and journals in paper are no longer needed when doing extensive research on a subject like engineering.
a) True
b) False

21. In the web address, http://www.doe.gov what does .gov mean?
    a) an organization
    b) a company
    c) a U.S.A. government website

22. What is plagiarism and can it get you sued?
    a) It is copying someone else's work and it cannot cause any trouble
    b) Anything that someone else writes is their property and if you use it without giving credit to them you might hear from their lawyer.
    c) Copying other people's work without permission is easy and fun to share.

23. Which will bring you the best search results if they are available?
    a) Subject searching
    b) Keyword searching
    c) Google "I Feel Lucky" search

24. Give the names of two commercial subscription only engineering databases
    a)
    b)

25. In a Bing or Google search, why would you put, “Global Warming” in quote marks?
    a) In order not to commit plagiarism
    b) Using the quote marks tells the search engine that you need to keep the two words together and in order to give them meaning
    c) The quote marks indicate these are not your words and you doubt that any such thing exists

26. I invented a perpetual motion machine. Can I get a patent on this?
a) Yes. It is a new or useful improvement on that existing device.
b) No, this defies a law of nature and therefore cannot be patented.
c) Yes. It is a new or useful improvement on that existing device.
d) Maybe a trademark would be better.

27. “Built Ford Tough” is an example of a
a) Trade secret
b) Patent
c) Trademark
d) Copyright

28. "The Matrix" is an example of
a) Patented film.
b) Copyrighted film.
c) Trademarked film.
d) Film with future trade secrets.

29. A property right covering an invention is called
a) Trademark
b) Copyright
c) Patent
d) Trade secret

30. Which two things are most important in performing a trademark search?
a) Knowing the Trademark’s name and owner.
b) Knowing the phrase and the picture used.
c) Describing the invention and the type of advertising to be used.
d) Describing the mark and identifying the product or service.

31. Jane Student wants to use an illustration from a patent in a PowerPoint class presentation. Is that okay? Isn’t it covered by copyright?
a) The illustration cannot be included because it is in a government publication.
b) The illustration can be included as long as she cites the source.
c) The illustration can be included as long as she gets permission from the inventor.
d) The illustration cannot be included because it is not fair use.

32. What is the most effective method for searching for related patents?
a) Keyword Searching.
b) Classification Searching.
c) Google.
d) Subject Searching.

33. When searching the CPC (Cooperative Patent Classification)
a) You need to look through long lists of possible similar classes.
b) You can drill down through groups using the outline function.
c) There are so many groups, it's hard to even start.
d) Keyword searching is not possible.

34. If you use someone's chart without permission:
a) You could be violating copyright.
b) You could be plagiarizing.
c) You could use it as long it is for scholarly purposes and you cite the source.
d) You could use a small part of it.

35. You found the Navier-Stokes equation in US 8,489,373. Choose the best answer.
a) You can use it; it's common knowledge.
b) You can use it as long as you cite it.
c) You can use it because it is for scholarly purposes.
d) You can use it because it is out of copyright.