AC 2011-2541: EMBEDDED ASSESSMENT OF LIBRARY LEARNING OUTCOMES IN A FRESHMAN ENGINEERING COURSE

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Abstract:
When students come to the library for an instruction session, we know that they have varied levels of experience with academic research and library tools. But how much can we assume? The background knowledge check is one of the Classroom Assessment Techniques from Angelo and Cross that librarians at our institution have adopted for library instruction. In this paper, we will discuss the library learning outcomes we identified as most important for a one-shot library session with a freshman engineering class, the usefulness of an embedded background knowledge check, share results from one particular freshman-level course, and address best practices for embedded and relevant follow-up assessment. We will also discuss active learning strategies used to meet the library learning outcomes.
Introduction & Background

In the past decade there has been an increased impetus for assessment of student learning outcomes in information literacy settings in general and at our institution. Because we regularly see all first-year engineering students in library instruction, we identified the multi-section Orientation to Engineering (ES 1000) course as a good place to begin assessing engineering students’ proficiency in information literacy skills. Many engineering faculty know the importance of information literacy, due in part to the inclusion of information literacy and critical thinking skills in the ABET criteria for accreditation. Papers by Oakleaf and by Riley, Piccinino, Moriarty and Jones have pointed out the overlap between ABET accreditation outcomes and ACRL/ILST standards. There are significant commonalities between the two sets of standards, which librarians can capitalize on to embed information literacy lessons in the engineering curriculum. Students are bound to benefit from a focus on “the ability to engage in life-long learning” -- one of the ABET criteria and a foundation of information literacy instruction.

Our institution requires all students to have at least one class with an embedded information literacy component. For engineering students, that class is ES 1000, which has the stated objectives of teaching students to “pose a research question, conduct a search on literature . . . present a written evaluation of your sources’ validity . . ., prepare a written report on your findings.” For the past five years we have held sessions for engineering freshmen taking the ES 1000 class. Library instruction sessions began as simple introductions to the library resources and initially were presentation-oriented. As the ES 1000 class developed and the research questions and projects became more involved, we began to develop more “hands-on” class sessions. The library classroom also had technology upgrades, making it easier to conduct these sessions. For the past two years we (the engineering librarian and the instruction coordinator) have worked together to create more meaningful library exercises and instruction sessions for the ES 1000 students. We believe that the sessions are helpful, and anecdotal evidence from instructors’ comments supports this belief, but how do we know if students are getting anything out of these one-shot sessions? To answer this question we decided to approach the College of Engineering to create a new model to assess our engineering students.

Much assessment of information literacy in engineering involves instructor evaluations and focus groups -- basically measures of student satisfaction rather than student learning. We wanted to measure student learning as directly as possible. Through our partnership with engineering faculty we have created an embedded background knowledge check in ES 1000 to assess what students know before they come to the library for an instruction session. With a simple web form we find out which library databases students have used before, how confident they are with academic research, their working definition of scholarly resources, and what search concepts they have heard of before. With this information in hand, we have a better idea of what we should focus on in the library session. Having the results of the background knowledge check also provides us with a jumping-off point for questions to actively engage students in the classroom.

Active learning in the classroom
In Fall 2009 we began jointly revising the lesson plan for the library instruction session for ES 1000 to include a worksheet for students to collect information on their topic of choice. We wanted to engage the students with active learning and give them some potential sources to take away as they worked on their engineering research project. This 2009 lesson plan was fairly successful, but we realized that students were not able to complete the entire worksheet in a 50-minute session. Knowing that we needed to scale back on the content covered and the tasks completed by the students, we considered what was really important and, collaborating with the coordinator of the ES 1000 course, identified three learning outcomes on which to focus:

1. Students will be able to distinguish between general and specialized databases in order to select the most appropriate database and maximize relevancy of search results.
2. Students will be able to develop topic-related vocabulary in order to search databases with maximum flexibility and effectiveness.
3. Students will be able to describe the difference between a peer-reviewed article and a popular article in order to select appropriate resources for use in an academic research project.

Once we identified the most important learning outcomes for the session, we identified ways in which students could learn those skills, practice them, and then demonstrate (for assessment purposes) their proficiency.

Constructivist learning theory tells us that starting with what students already know provides a launching pad for authentic learning. We should build on what students already know, and give them authentic problems to work on. Active learning is a central tenet of constructivism, and a guiding principle for our instruction program. We started the ES 1000 instruction session by asking students how many of them start their research with Google. By a show of hands, we could easily see that (as expected), the majority of students start there. Using a student-chosen research question, we demonstrated a search in Google, and then showed students how to use the Google Wonder Wheel to identify related topics and additional keywords. As illustrated by Figure 1 a keyword search for robot, swarm, oil, and spill gave the following results for a student’s search on one of the many topics related to robotics.

![Figure 1: Sample Google Wonder Wheel search](image)

This process of going from a regular Google search to look at related searches in the Wonder Wheel display helped students to narrow their research focus and/or identify additional keywords.
that might be helpful, helping them to achieve our second learning outcome: “Develop topic-related vocabulary in order to search databases with maximum flexibility and effectiveness.”

After searching Google and using the Wonder Wheel, we directed students to take their search into Google Scholar. Here we discussed the difference between sources found with Google and sources found with Google Scholar. We asked students to identify differences between popular and peer-reviewed sources, and we got really interesting answers in class. One student confidently raised his hand and said, “Peer reviewed is like Wikipedia, where a lot of people have edited and added to it.” First-year students came in with little or no understanding of what a peer-reviewed article is (as will be further discussed in the “Results” section). We discussed the actual definition of peer review in academia and encouraged students to ask evaluative questions as they found sources in Google Scholar to determine if their results were peer reviewed or not.

Taking what they had learned in Google and Google Scholar, students were then directed to a course guide, which lists subject-specific databases and contact information for the Engineering Librarian. Students chose a subject-specific database (according to their research focus) and tried using their keywords once again. Then students listed publication information for one potentially useful article on a worksheet submitted to the librarians at the end of the session.

**Embedded assessment of learning outcomes**

As earlier stated, we wanted to learn whether our lesson plan was effective and whether students could meet our learning outcomes. The engineering librarian has been working with the engineering department for many years and a close relationship has developed. Due to this relationship, the coordinator of the freshman orientation class was very amenable to the idea of embedding a Library Background Knowledge Check (pre-test) in the course. The pre-test was available on the course website, and students were required by their instructors to complete the pre-test before coming to the library with their classes. We based the pre-test on the Background Knowledge Probe described by Angelo and Cross in *Classroom Assessment Techniques*. They describe the usefulness of such a probe for instructors as a way to determine the most effective starting point and appropriate level at which to begin instruction. “These probes also provide feedback on the range for preparation among students.” The usefulness for students is that a background knowledge probe “focuses attention on the most important material . . . providing both a preview of what is to come and a review of what they already know about that topic.” We purposely kept the pre- and post-tests very brief (4 and 5 questions, respectively), in order to improve the rate of student response. (The instrument is attached as an appendix.) We chose to use Google Forms for this probe, because of its relative simplicity, sortability, and flexibility. It was useful to embed the knowledge check on the course website so that students had easy access and we didn’t have to spend any of our one-shot session gathering the information -- we could review the information, sorted by instructor, right before meeting the class. And, as *Classroom Assessment Techniques* suggests, the pre-test gave students a preview of what would be discussed in the library instruction session.

At the end of the term we sent out another knowledge check to the students. We used the same format (Google Forms) as the pre-test and embedded the link to our questions on the course website. (Instrument attached as appendix.) The pre- and post-tests allowed us to assess two of
our learning outcomes (selecting appropriate databases and describing the difference between a peer-reviewed article and a popular article).

Gathering the worksheet completed in class allowed us to assess the other learning outcome (developing topic-related vocabulary). We used a rubric to score the 208 worksheets we collected, rating students’ topic-related vocabulary and success in finding a relevant article. (Worksheet and rubric attached as appendices.) Using the combination of pre- and post-knowledge probes and the worksheet completed in class allowed us to measure student learning outcomes and plan for adjustments to future engineering library instruction.

**Results of student learning assessment**

**Learning Outcome 1: Choosing an appropriate database**

There were 256 students enrolled in ES 1000 in Fall 2010, and 192 of them responded to our background knowledge probe, for a response rate of 75%. When asked which databases they had used in the past, nearly half responded “I don’t think I have ever used a database.” Of those who had used a database, Academic Search Premier (EBSCO) was the most common response, followed by Google Scholar. Only 6 students had used the more subject-specific databases Web of Science or Engineering Village (Table 1).

<table>
<thead>
<tr>
<th>Database</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Search Premier</td>
<td>61</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>50</td>
</tr>
<tr>
<td>Lexis Nexis</td>
<td>17</td>
</tr>
<tr>
<td>Web of Science</td>
<td>4</td>
</tr>
<tr>
<td>Engineering Village</td>
<td>2</td>
</tr>
<tr>
<td>I don’t think I have ever used a database</td>
<td>88</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
</tr>
</tbody>
</table>

*Table 1: Responses to question “Which databases have you used in the past?” Note: Students could choose more than one answer*

On the post-test we asked students about databases again. We had a lower response rate to the ES 1000 post-test -- 146 out of 256 students responded for a response rate of 57%. We believe that the response rate would have been higher if we had surveyed students earlier. ES 1000 is an 8-week course and we asked students to respond to the post-test after the course was effectively over, in weeks 9 and 10 of the semester. Next fall we will be prepared to post a link to the post-test a week before the course ends so that instructors will have a chance to remind students face-to-face that they need to complete the post-test. An additional issue that negatively impacted the response rate was that the link initially led students to the pre-test, and a few students completed that quiz (again) instead of completing the post-test.

In the post-test, we asked students which database they would choose to find information on robotics, and then we asked them to explain their choice. Google Scholar was the most popular choice, followed by Engineering Village and Academic Search Premier, as shown in Table 2.

<table>
<thead>
<tr>
<th>Database</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Scholar</td>
<td>58</td>
</tr>
<tr>
<td>Engineering Village</td>
<td>37</td>
</tr>
</tbody>
</table>
Table 2: Responses to question “Which of these databases would be your first choice for finding information on robotics?”

We also asked students to explain their choice and then coded their responses to identify beginning, developing and exemplary proficiency with distinguishing between general and specialized databases in order to select the most appropriate database (Table 3). We defined beginning proficiency as listing simple reasons such as convenience, ease, or familiarity. An example of a comment from a student who demonstrates beginning proficiency in this area is a student who chose Academic Search Premier and, when asked why he would choose that database, wrote: “I forgot where the Engineering Village was and it was the one I saw first.” This student obviously has not thought about the difference between general and specialized databases, and will likely not maximize the relevancy of search results.

Students who demonstrate developing proficiency listed abstract reasons for choosing a database, citing database characteristics such as credible information or a variety of sources. Another student who chose Academic Search Premier, and whom we identified as having a developing proficiency, explained her database choice: “I would choose EBSCO because there are several different views presented around any given topic. Both positive and negatives are presented by this database. Also EBSCO can direct you towards other useful sources.” She has evaluated the credibility of the database, but not necessarily the relevancy.

Students who demonstrate exemplary proficiency in distinguishing between databases to maximize relevancy describe specific reasons for choosing the resource based on their research topics. One more student who chose Academic Search Premier explained why: “This, for my topic, worked best. Web of Science is also a great choice and was helpful, but I needed less technical articles. I was looking more for the ethical and social base for my argument, so the broader view in EBSCO gave me good results.” Although this student chose a general rather than a specialized database for robotics research, she had a clear reason for doing so.

<table>
<thead>
<tr>
<th>Database</th>
<th>Beginning</th>
<th>Developing</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Search Premier</td>
<td>11</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>Engineering Village</td>
<td>4</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>26</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Lexis Nexis (3)</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Web of Science (7)</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Other (7)</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>45 students – 31%</td>
<td>74 students – 51%</td>
<td>27 students – 18%</td>
</tr>
</tbody>
</table>

Table 3: Number of students in each category (beginning, developing, and exemplary) who chose the given databases and then explained why they would choose that database.

We are dissatisfied with the results in this learning outcome, particularly that 31% of students were in the beginning category, and chose a database based on convenience or familiarity. Next fall, our goal is to have at least 50% in the exemplary category. This learning outcome involves
affective learning -- students must value using an appropriate database, or understand the benefits of using a particular database, in order to make a good choice. We are discussing how to best instill that value in students.

**Learning Outcome 2: Develop topic-related vocabulary**

The most complex learning outcome we identified as vital for first-year engineering students was the ability to develop topic-related vocabulary in order to effectively search for useful information. As stated in the “Active learning” section above, students started their research in Google, then used the Google Wonder Wheel to identify interesting facets of the original search and listed additional keywords from the Wonder Wheel on their worksheets. At the end of the worksheet, after developing keywords and trying the keywords in a few different search tools, students cited one article found on their topic.

Students demonstrating exemplary proficiency listed more than three relevant keywords and found an article relevant to the research topic; students demonstrating developing proficiency listed 2-3 relevant keywords and found an article somewhat relevant to the research topic, but general or broad; and students demonstrating beginning proficiency listed only one relevant keyword or phrase OR non-relevant keywords and found an article not relevant to the research topic (Table 4).

<table>
<thead>
<tr>
<th>Proficiency Level</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>16 students – 8%</td>
</tr>
<tr>
<td>Developing</td>
<td>74 students – 36%</td>
</tr>
<tr>
<td>Exemplary</td>
<td>118 students – 56%</td>
</tr>
</tbody>
</table>

*Table 4: Number of students in each category who demonstrated ability to develop topic-related vocabulary and find relevant information*

We were pleased with these results, as over 50% of students demonstrated exemplary proficiency and only 8% beginning. Notably, many of the students we ranked as beginning were non-native English speakers, which may warrant additional study and consideration. We do make a point of talking to non-native English speakers one-on-one in the classroom if we see that they are having trouble. A recent article by Bordonaro suggests that database searching is a language-learning activity, and there are special considerations for the library instructor who teaches international students and other non-native English speakers.

**Learning Outcome 3: Define a scholarly, peer-reviewed article**

Engineering instructors told us that they value scholarly literature and want their students to be able to find and use it, even at the 1000-level. With some trepidation, we agreed to discuss peer-review with the first-year engineering students. We decided to find out before the library session how many students already understood peer review. On the background knowledge probe we asked students to identify characteristics of a scholarly article. Their choices were:

- **Lengthy** -- 5 pages or more
- **Has an author or authors who are experts in a subject area (rather than being reporters)**
- **Is written to be of general interest to a wide variety of readers**
- ** Relates to academic study or research**
- **Includes advertisements and glossy illustrations.**
Three of the five options (those underlined above) are correct. As shown in Table 5, only 46 students (24%) identified all three correct answers and none of the inaccurate answers.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1 correct element</td>
<td>64 students</td>
<td>33%</td>
</tr>
<tr>
<td>(Beginning Proficiency)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 correct elements</td>
<td>70 students</td>
<td>37%</td>
</tr>
<tr>
<td>(Developing Proficiency)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (all) correct</td>
<td>46 students</td>
<td>24%</td>
</tr>
<tr>
<td>elements (Exemplary Proficiency)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chose incorrect</td>
<td>12 students</td>
<td>6%</td>
</tr>
<tr>
<td>elements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 5: Responses to question “How would you describe a scholarly article?”*

During the class session, we discussed what a scholarly article is and when it is useful. We asked students to identify their search results as scholarly or popular, and we answered questions about why it matters.

In the post-test, we asked students again to identify the characteristics of a scholarly article. As illustrated in Table 6, we saw some improvement in this area, but not significant change:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 correct element</td>
<td>33%</td>
<td>27%</td>
</tr>
<tr>
<td>– Beginning Proficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 correct elements</td>
<td>37%</td>
<td>37%</td>
</tr>
<tr>
<td>– Developing Proficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 correct elements</td>
<td>24%</td>
<td>33%</td>
</tr>
<tr>
<td>– Exemplary Proficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chose incorrect</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>elements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 6: Change between pre- and post-test in student ability to identify characteristics of a scholarly article.*

We theorize that students’ lack of improvement in this area has a few causes. First, the discussion about the differences between scholarly and popular sources was not vital to their final project, while developing a searching vocabulary and choosing a database were. Second, this seems to be a totally new concept for many of the students, as evidenced by the student who thought Wikipedia was a peer-reviewed source. Repetition and experience with actual peer-reviewed sources will reinforce the concept over time. Finally, we’re not convinced that this is an appropriate learning outcome for first-year students. They are just being inducted into the scholarly community of engineers, and their information needs may be better served by less technical articles.

**Student Confidence**

On the pre- and post-tests, in addition to probing for students’ knowledge and experience with research concepts and tools, we asked one confidence question. Angelo and Cross suggest that a confidence survey helps instructors to identify where students feel comfortable and where they do not, and reflecting on confidence allows students to identify, confront, and communicate any academic anxiety, which promotes a healthier and more effective learning environment.

Gathering this type of information is easy, but figuring out how to address these findings is difficult. Over-confidence may prevent students from asking questions or seeking assistance, while under-confidence may keep students from joining discussions or working hard at something they feel they’ll never really understand. Both circumstances are depressing. Our purpose in asking this question was to find out how confident students were with academic research at the beginning of the class, and to see if there was improvement over the course of the class.
On the pre-test we asked, “How confident do you feel about doing academic research?” The majority of students reported feeling “somewhat” confident before attending their library instruction session (Figure 2).

![Confidence](image)

Figure 2: Responses to question “How confident do you feel about doing academic research?”

We repeated the confidence question on the post-test, asking students to rate their confidence about doing academic research:

<table>
<thead>
<tr>
<th>Pre-Test Confidence</th>
<th>Post-Test Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very</td>
<td>16%</td>
</tr>
<tr>
<td>Somewhat</td>
<td>65%</td>
</tr>
<tr>
<td>Not Very</td>
<td>18%</td>
</tr>
<tr>
<td>Not at All</td>
<td>1%</td>
</tr>
<tr>
<td>Very</td>
<td>40%</td>
</tr>
<tr>
<td>Somewhat</td>
<td>56%</td>
</tr>
<tr>
<td>Not Very</td>
<td>4%</td>
</tr>
<tr>
<td>Not at All</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 7: Change between pre- and post-test in students’ ranking of their confidence in conducting academic research.

Table 7 shows a significant increase in students rating themselves as “very confident” about doing research. We are concerned that some of these students may be over-confident. This is one area that may warrant future study: does confidence correspond to knowledge. Syracuse University has developed a Perceived Competence in Information Skills (PCIS) measure, which we may consider adapting in the future.14

Conclusion

Our final accounting of student proficiency in our three learning outcomes is reflected in Table 8.

<table>
<thead>
<tr>
<th>Distinguish between general and specialized databases in order to select the most appropriate database and maximize relevancy of search results.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Proficiency</td>
<td>45 students – 31%</td>
</tr>
<tr>
<td>Developing Proficiency</td>
<td>74 students – 51%</td>
</tr>
<tr>
<td>Exemplary Proficiency</td>
<td>27 students – 18%</td>
</tr>
</tbody>
</table>

Develop topic-related vocabulary in order to search databases with maximum flexibility and effectiveness. (Worksheet)
Beginning Proficiency 16 students – 8%
Developing Proficiency 74 students – 36%
Exemplary Proficiency 118 students – 56%

<table>
<thead>
<tr>
<th>Proficiency Level</th>
<th>Number of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Proficiency</td>
<td>39 students</td>
<td>27%</td>
</tr>
<tr>
<td>Developing Proficiency</td>
<td>55 students</td>
<td>37%</td>
</tr>
<tr>
<td>Exemplary Proficiency</td>
<td>48 students</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 8: Student learning outcomes, ES 1000, Fall 2010

Overall, this was a very successful implementation of a new lesson plan, including embedded assessment tools. We believe our lesson plan, worksheet, and assessment tools from this class will be adaptable for other 1000-level classes we teach in various disciplines.

Our goals were to (1) give students an assignment they could finish within the 50-minute class period, (2) help them choose useful databases based on their research topics, (3) guide them to find information they could actually use in the course research project, and (4) provide students with the knowledge to determine whether an article is peer-reviewed. We found that the worksheet was easily completed in class if students were focused and on-task. The one exception to this was non-native English speakers, who had a notably more difficult time completing the worksheet. The post-test showed us that 69% of students chose a search tool based on developing or exemplary criteria (see Table 8), so we count that as a success as well. In our review of the completed worksheets we found that students did find useful articles if they had good research questions to begin with. Unsurprisingly, if students were less well-prepared and had a flimsy or non-specific research question, they were less likely to leave with useful search results. Our comparison of pre- and post-test results reveals that we were less successful at helping students understand the difference between a peer-reviewed and a popular article. We have begun discussing the validity of this as a learning outcome for first-year students. Is peer-reviewed research the most useful type of source for them? As students enter a discipline and a scholarly discourse, they are most likely not prepared for the technical writing, and we may serve them more effectively by discussing a different set of criteria for evaluating articles: Can you read it? Who is the publisher/author? Do you trust that publisher/author? Why? Can you identify bias in the writing? We want to avoid a checklist approach, but give students criteria about which to think critically as they evaluate potential sources for an academic research project.

Aside from this modification – shifting our focus to a more nuanced approach to source evaluation – we will work more closely with ES 1000 instructors in the future before the library instruction session to ensure that students have developed research questions before their visit, and afterwards to develop even more authentic assessment. We would like to look at final projects in addition to a pre- and post-test to find out whether library instruction affects students’ final products for the class.

We recommend our assessment approach to other librarians who work with first-year students, engineering or otherwise. Library assessment guru Debra Gilchrist describes assessment as knowing what you are doing, knowing why you are doing it, knowing what students are learning as a result, and changing because of the information. The model presented here is a
sustainable way of gathering the information necessary to make informed decisions and practice evidence-based decision-making regarding library instruction.

References


Appendix I: Pre-Test

ES 1000 Library Background Knowledge Check
Before you come to the library with your class, we'd like to know a little bit about what you already know about library research.

* Required

Your Name (Last, First) *

ES 1000 Instructor's Name * Tell us whose section of ES 1000 you are in

Which databases have you used in the past? * Please check all answers that apply.
- Academic Search Premier (EBSCO)
- Web of Science
- Lexis Nexis
- Engineering Village
- Google Scholar
- I don't think I've ever used a database
- Other: 

How confident do you feel about doing academic research? * Choose one answer
- Very
- Somewhat
- Not very
- Not at all

Which of these concepts have you heard of before? * Please check all answers that apply.
- Boolean searching (and, or, not)
- Truncation (*, !)
- Phrase searching (using quotation marks)
- Subject headings or descriptors
- I've never heard of any of these concepts

How would you describe a scholarly article? * Please check all answers that apply.
- Lengthy – 5 pages or more
- Has an author or authors who are experts in a subject area (rather than being reporters)
Appendix II: Post-Test

ES 1000 Library Knowledge Check
Now that you have (nearly) completed ES 1000, we'd like to know what you learned about library research.

* Required

Your name (last, first) *

ES 1000 Instructor's Name * Tell us which section of ES 1000 you are in

Which of these databases would be your first choice for finding information on robotics? *
Choose one answer

- Academic Search Premier (EBSCO)
- Web of Science
- Lexis Nexis
- Engineering Village
- Google Scholar
- Other:

Why would you choose the above database? * Explain your choice in 2-3 sentences

Did you use any of the following search strategies in your research project for ES 1000? * Check all answers that apply

- Boolean searching (and, or, not)
- Truncation (*, !)
- Phrase searching (using quotation marks)
- Subject headings or descriptors
- No, I didn't use any of these strategies

How would you describe a scholarly article? * Check all answers that apply

- Lengthy -- 5 pages or more
□ Has an author or authors who are experts in a subject area (rather than being reporters)
□ Is written to be of general interest to a wide variety of readers
□ Relates to academic study or research
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