Mentoring Industrial Distribution Students on their Junior and Senior Papers

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Librarians do not typically have opportunities to assist student engineering teams. Our involvement is usually at the class lecture level. However, if given a chance, librarians are well equipped to assist students with their research for team projects. A writing assignment in an upper-level engineering core course is a good way for librarians to become immersed in a class and to build relationships with students on a one-to-one and team level. As academic professionals, we have various mentors to assist us with job skills, promotion/advancement, and networking. Students have similar needs and librarians can be a safe source to discuss information deficit areas and provide team dynamics coaching.

Related Literature

The literature has many examples of librarians teaching information literacy to classes. However there are fewer articles of librarians mentoring students. Typically libraries engage students in the freshman year via the first year English class or the freshman seminar. In most cases the library instruction is long forgotten by the time junior and senior students write their first technical paper or they do not transfer the library skills from their first year to their engineering writing projects. Also the databases that they used for the English class are not relevant to the engineering projects. Amekudzi, Li, and Meyer[1] wrote an article about the undergraduate civil engineering students' experience with a library workshop that prepared them to write a technical paper for a civil engineering course. The workshop was created at the instructor's request and was 1.5 hours long. In addition to specifically demonstrating the engineering databases, the workshop explained search strategies, and information skills. The students were given 30 minutes for the hands-on exercises to use the engineering resources. Tucci's paper[7] discusses the seminar program that all undergraduate chemistry students take from freshman to the senior year. The yearly seminars consist of two, one-hour sessions that cover information literacy, database searching, and mentoring. Again this program was initiated by the chemistry professors and the librarian was invited to participate. The mentoring for the freshman and sophomore years are conducted by the librarian and the content changes per the year the student is in. For example, freshman receive advice on studying, personal concerns, etc. The mentoring for the last two years is performed by the faculty that the student is assisting with research.

The two papers illustrate that faculty initiated library interventions are more embedded because the faculty welcomes the librarians into the course and/or departmental activities and emphasizes the librarians' role to the students. However, then the question arises, how deeply can librarians be integrated or embedded in these activities? Sullivan's and Porter's paper[5] discuss various ways to integrate the libraries and information literacy into courses. Though they caution that flexibility is required, as sometimes librarians get caught up on teaching only search skills and finding databases, and instead they need focus on choosing and narrowing topics, concept mapping, and developing search terms.

Finally in the article by Paretti et al[4], the authors researched the types of team conflicts experienced by teams in Capstone classes. While there were different reasons for conflict, most of faculty considered the problems to be generated from team dynamics. Conflicts or problems making decisions related to the project itself, including scope, criteria, alternative selection emerged as a prime consideration for teams[4] The mentoring that supports capstone teams is conducted by the course instructors and graduate assistants. However, librarians who have a background or training in mentoring can assist overburdened faculty with mentoring the capstone teams. The librarians are outside observers can therefore offer unbiased advice.

Engineering Professional Paper

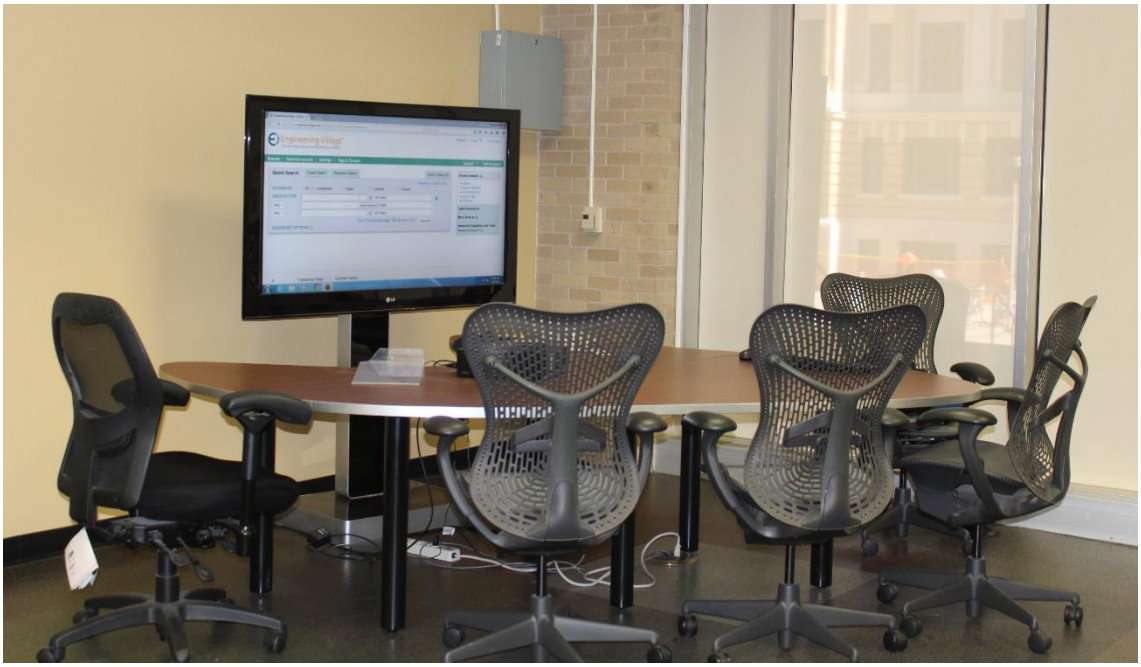
Texas A&M University is a land-grant institution that was founded in 1876. The College of Engineering has 16,900 students and 500 faculty and is the largest college on the College Station campus[3]. The Department of IDIS has 1682 students and 46 faculty[2]. The IDIS 303 course is a writing intensive, 3 credit, junior-level, core course. The major project is a professional technical paper that is worth 10% of the class grade. The topic of the paper is mechanical power transmission (MPT). The IDIS 403 course is also a writing intensive, 3 credit, senior-level course. Depending on the students' track, this can be a required course. The topic of the senior professional paper is fluid power transmission (FPT). For the project in either course, the class is divided into student teams consisting of three to four students. In 2009, the librarian began assisting with the two courses. From 2009 to the Spring semester of 2016, the librarian met with 7 to 20 IDIS 303 teams per semester excluding the summer session. The librarian consultation introduces the students to the library services and resources. In the fall semester of 2015, the professor requested that the teams meet twice with the librarian. He said that the teams produced better papers when they met the librarian more than once. Below is the description and requirements of the professional paper.

> **Professional Project:** This project will help develop your research and professional writing skills; it helps form knowledge of mechanical power transmission and develops your team building skills. Your project is based upon a system or component in the MPT marketplace. Your team will submit multiple progress reports with the final deliverable as stated on the syllabus; no late reports will be accepted. Topics will be determined by the team's own interests but will remain within the scope of the course and a final topic must be approved by the professor. Teams will be assigned by lottery the 2nd week. See the Professional Project Guidelines for more details[9].
>
> You have a two part objective for this project. The first is to analyze a component within the scope of the course. You should gain as much knowledge on the specifics of the product and the engineering technical knowledge needed to understand the functionality of the product. This is to include the technical knowledge on the functionality, reliability, limitations and purposes for use. The other part of the assignment is to expand your scope by finding or developing an innovation with the produce you chose… However, areas that will be highly encouraged to focus on are product innovation and new service development. This can be a new business service or an improvement on a design, material enhancement or any other topic you may find that will make a change in the future operation, reliability or application of your product choice. Use all sources at your disposal, however no general internet sources will be accepted as a reference for your

> project, for example “Wikapedia[sic]” may not be used as a source but can be used for your general knowledge purposes… The report must be technically oriented toward the topics of the class and a heavy emphasis should be on the technical expertise that you will need to know to work for or service customers that use FPT components in application[8]…

The professor includes the library guide’s url and the librarian’s contact information in his syllabus and on the Blackboard/eCampus course page. The teams call or email the librarian to make an appointment. The appointment usually is 30 to 60 minutes long. The teams inform the librarian of their topic when they make the appointment. Initially the librarian took walk-ins, but she realized that some topics took time to learn. She therefore started to require that teams schedule their appointment at least 24 to 48 hours before the desired time so the librarian had ample time to prepare for the teams’ topics. All of the team members are encouraged to attend the library session. Before the session, the librarian researches the topic so that she knows which databases, ebook collections, and websites have the useful information. The library session is held in the library’s consultation area which has a station with a 42 inch screen, seats five to six people and has a wireless keyboard and mouse, see Figure 1. The students are encouraged to use their electronic devices to follow along or take notes.

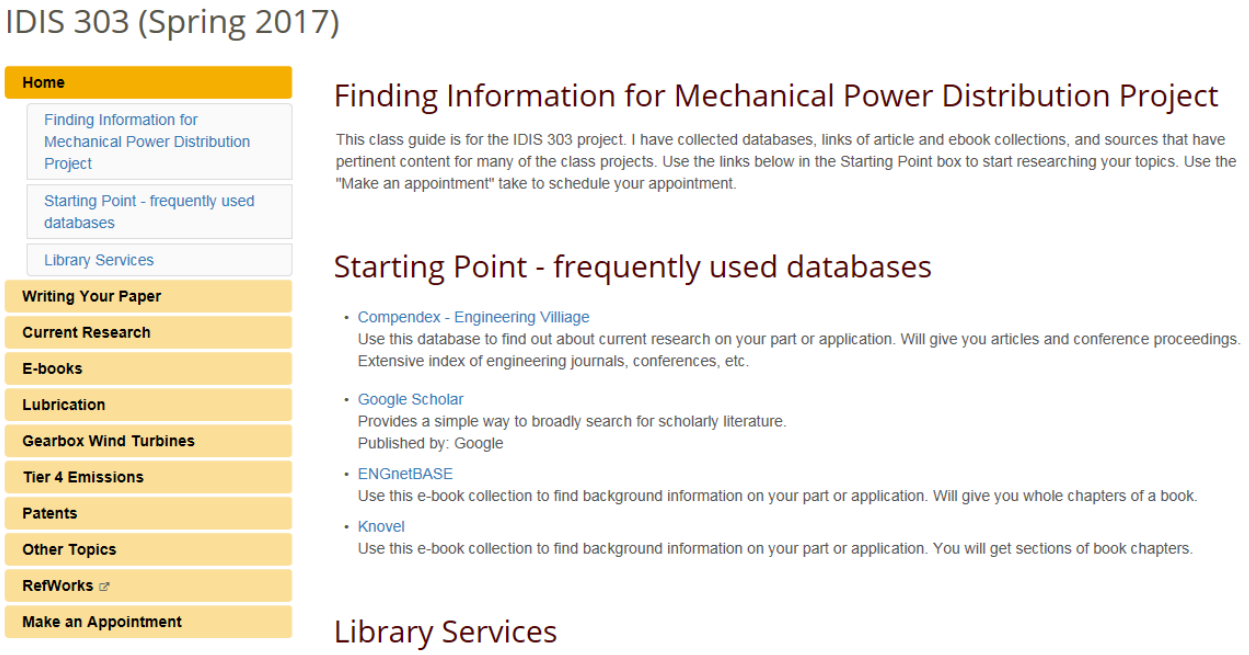
Figure 1: Teams Consultation Desk



The team meeting includes showing the class guide, demonstrating each relevant database/source, and explaining which library services to use for the project. Typically the first 20 minutes cover the class guide, Figure 2, project scope, Knovel or Engnetbase, and

Compendex. For example, if the topic is lubrication and the team had only narrowed down the topic to any type of synthetic lubricant, then the first step would be for the librarian to ask about which brand or formulation was being considered. If the team did not know then the librarian would use Knovel or Engnetbase and search for "synthetic lubrication." She would show the results to the team and discuss how the database search worked. Finally, she would open one result and discuss the content. Afterwards, she would go back to the results and ask the team which results they wanted to explore or if they wanted to amend the search. Once the team agrees on a topic then the librarian would show them Compendex. She would explain how the database works and conduct the first search. The team and the librarian would discuss the results and refine them by using the facet tools. The team would continue searching until either they firmed up the topic or decided to look elsewhere.

Figure 2: Library Guide for IDIS 303



Whenever a team was having problems developing search terms/keywords, the librarian would switch over to Google Scholar to give them a familiar place to search. For some reason students had an easier time experimenting in Google Scholar than in any other database. The librarian and students then discussed the use of quotes, date ranges, and the advance search. Afterwards, the specialized engineering databases would be searched with the newly found search terms. As documents are found, the librarian explained where each would fit in their outline. Emphasis was placed on finding a variety of information to fill a 15 page paper. Sometimes the teams gravitated to the history of technology and pricing but that information is out of scope. The librarian would redirect them to look for technical information. Google was used to find company and supplier catalogs to obtain part numbers and specifications.

During the consultation, whenever a student found anything promising, the librarian would ask them to share it with the rest of the team on the large monitor. At that point the librarian would hand over the keyboard and mouse to the student. Since this is a collaborative library session,

the students will ask questions and talk to each other. Typically when there is a second meeting, the team will email their outline and best documents that illustrate their part and application. With that information, the librarian searches for the exact part and application. Sometimes the team needs maintenance and/or replacement manuals or a patent that has the diagrams of the layout.
Second meetings are typically shorter than the first meetings and only one or two students from the team attend. Since they understand the project and have received approval from the professor on their topic, the students are more confident and focused.

Mentoring

The teams are small, 3 to 4 students and this makes it easier for the librarian to watch each student to see if they understand the content. The topic determines the content of the library session so the students are getting a customized session which leads to better student engagement. Typically the teams would see the librarian once between week 4 and week 8 of the semester. Over time, the librarian realized that the teams that met with her earlier in the semester had the advantage of learning the full breadth of the project sooner and picked topics that had robust information sources. The teams that came in later in the semester were rushed and often picked topics that were not fleshed out. The professor who taught both classes preferred to slowly reveal the project requirements which led some students to misunderstand the scope of the project and research unneeded content.

While the professor required that the teams meet with the librarian the initial team turnout was low. Slowly over time, the teams that did come in would recommend the consultation to other teams because it was useful and they got positive feedback from the professor. Interestingly, the teams' endorsement meant more to the other teams than the professor's requirement. As each semester passed, more teams came in for their library appointment. The librarian attributes the positive attitude change to the librarian's topic preparation and additional support to the team.
When the librarian first taught these courses, the previous librarian advised her that the 'good projects' were the ones which made use of the library resources. However, as the current librarian become more familiar with the topics, she also added 'other resources' that were not part of the library collections such as patents, product catalogs, and vendor pages for additional information. Preparation became more essential for more effective team meetings. Each team would get a customized session which included the different resources that could be of value for the technical paper. The teams responded positively and respected the librarian when she was well versed on the teams' topic.

Resources Used for Project

The librarian reorganized the class guides every semester until the best format was developed. The class guide for IDIS 303 was for MPT topics (Figure 2) and all of the resources listed applied to at least one major division. For example there were sections for Aerospace Engineering, Petroleum Engineering, automotive, lubrication, etc. The IDIS 403 guide was for FPT topics and it contained resources primarily for hydraulics and pumps. The teams that did

not remember or understand which resources to use for the different sections of the paper either requested a second meeting or asked for an email recap. Below is a select list of resources that were taught to the teams.

Table 1: Information Resources Used for IDIS Courses

Resource	**Type**	**Content**	**Purpose**
Compendex/Inspec on Ei Village	Abstract/citation	Articles, conf. proc.	Current research, case studies, innovation
Knovel	eBook collection	Technical books	Background
CRC Engnetbase	eBook collection	Technical books	Background
Library Catalog	Library catalog	Books, conf. proc.	Background
Society for Automotive Engineers (SAE)	Full-text article/citation/abstract	Articles, conf. proc.	Current Research, case studies, innovation
CSA/ProQuest/Wilson past databases	Abstract/citation	Articles, conf. proc.	Current research
OnePetro (SPE)	Full-text article	Articles, conf. proc.	Current research, case studies
Petroleum Abstracts Tulsa Database	Abstract/citation	Articles, conf. proc., patents	Current research, patents
Aerospace Research Central (AIAA)	Abstract/citation	Articles, conf. proc.	Current research, case studies
IEEE	Abstract/citation, some full-text	Articles, conf. proc.	Current research, innovation
Google Scholar	Index/citation	Articles, conf. proc., books, patents	Current research, innovation
Google Patents	Abstract/citation	Many full-text	Research, innovation
Google	Mix, index/citation	Everything: catalogs, company info, govt. info.	background
Business Source (ProQuest)	Abstract/citation	Mostly full-text articles	Business forecasting, company/product info
ABI Inform	Abstract/citation	Some full-text articles	Business forecasting, company/product info

Thesis & Dissertation (ProQuest)	Abstract/citation	Some full-text theses and dissertations	Case studies
Thomasnet.com	Index, some full-text	Catalogs, company info	Parts and vendor info

Additional Support

As the librarian met with each team, she realized that the teams and the individual members had various questions beyond the library resource questions. Common questions were: what is the scope of the paper? Is this a good topic? How do we organize the paper? How to we determine who does what for the paper? How do we get our instructor to give us more feedback?

She also noticed that the students occasionally needed assistance with team dynamics and paper writing skills. The team dynamics were causing the project to suffer and the librarian thought that she could easily coach them on team strategies. If a team was torn between two topics, the librarian would recommend that the topic with the most information be selected. In cases where there were multiple topics, the recommendation was for the members to each take a topic and research it for a couple of hours. At the end of the research time, each student would present their findings and then the team would vote on the most promising topic. This turned out to be a frequent issue. Sometimes, the teams did not have a leader and they wanted the librarian to help them decide who it should be. The advice was for the student who had the work experience or contact with the vendor to volunteer to be the leader. The teams seemed satisfied with the advice. Sometimes there was a team member that needed more time to learn how to use the databases and the librarian would encourage the team members to return on their own if they needed additional training. This was especially important when there were students with special needs. At the end of every session, the librarian invited the teams to email her if they encountered issues with the databases or search strategies. Some teams did email the librarian for extra tips on searching and when they needed information for specialized engineering subsections.

The paper writing skills fell under the Writing Center and the librarian initially referred all questions to them. However, the Writing Center staff did not understand the technical aspects of the topic and could not advise the team on organization. When a team asked for organization assistance, the librarian would ask the teams to show her their outline to help them expand the outline based on the professor's guidelines with such areas as maintenance, replacement, or the system of the product. There were also questions on how to refer to items in the appendix in the paper and the librarian coached on how to seamlessly mention the content.

The professor started to depend on the librarian to vet topics and refocus teams who did not understand the scope of the project. Sometimes teams would come in at week 8 of the semester and say that the professor had referred them to the librarian. The librarian would ask to see the instructions, and to the librarian's surprise the professor would have written, "go see Pauline, she will help you get back on track." It was rather rewarding to see that the professor was referring

the students to the librarian. Whenever there was a question on a topic or content, the librarian always referred the teams back to the professor for clarification.

Assessment

The librarian is working on assessing her teaching with the teams and learning what the students need in terms of research resources. She has partnered with an Education Librarian to explore different methods to assess the two classes. Currently they are using a one-minute essay to document what students have learned after the first library session. Later, after the due date of the technical paper, they plan to hold focus group sessions with the students to learn about their research needs and how they filled them. Another idea for the fall semester is to follow a few teams and determine when and how often the students need intervention from the Library. The results from the assessments will be available in 2018. The professor of the courses is extremely busy and has other priorities and therefore cannot help with a library assessment. Any assessment will have to be done separately from him. Also the professor also does not want to share the papers from previous semester because he does not want the students or the librarian to be influenced by past papers.

Future Implications

Librarians can offer their services to engineering and science departments to support students working on their capstone projects. For the librarians that are embedded into courses, they will be better informed of the course requirements and have improved access to the students. In addition to helping the students find suitable research, the librarians can mentor them when other personnel are unavailable.

In 2013, the Texas A&M University's Engineering College began their 25 by 25 initiative[6]. The goal is to double the engineering student body to 25,000 by 2025. The broader implications for the Library are not clear. For this course, in Fall 2016, the number of student teams for IDIS 303 went up from 25 to 35. In the following semester, the team count went up again to 50. The large increase of teams made the previous model of one main librarian with assistance of two other librarians as backups unsustainable. The librarian is exploring different options to meet the needs of these two courses. One solution, which the Library is implementing as a pilot, is to train additional librarians to meet with the teams. Another option which is being explored, is to create online tutorials that replace some the content that the librarian was covering in the library session. The added benefit would be that the teams could access the tutorials 24/7. This is a good option, but online tutorials should be used only supplement the library session. Otherwise, the students would miss out on the customized sessions and team mentoring. These two items are extras and were not specified by the professor, but it is providing valuable support for the students. The Library is monitoring the other engineering departments to see how the course load will impact those departmental librarians. At some point, someone will have to decide on what is sustainable and scalable for the Library. Despite increased workload for a librarian, the benefits that the students derive from the embedded librarian model are worthwhile and impactful. The students learn more in depth research skills from these activities than from typical one shot library lecture style outreach.

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