ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION

Paper ID #49674

Enhancing Engineering Education through Faculty-Library Collaboration

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Chassidy Miles is the Engineering and Learning Technologies Librarian at the University of North Texas. She possesses a unique blend of experiences that includes serving as a public librarian, system administrator, and user experience researcher. This multifaceted background equips her with a profound understanding of the intricacies of library services and the dynamics of user engagement. Her approach is rooted in innovation and tailored solutions, ensuring the library remains a valuable resource for the academic community.

Session XXXX

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Abstract

In the rapidly evolving landscape of engineering education, academic libraries can play a critical role in supporting project-based learning and career development. This paper explores the findings of a project aimed at enhancing library services for the University of North Texas (UNT) College of Engineering (CENGR). Guided by three core objectives—identifying essential library services and resources, enhancing support for project-based learning, and strengthening engagement with faculty and students—the project utilized qualitative and quantitative research methods to address the specific needs of engineering students and faculty.

Surveys conducted with CENGR faculty and students offered valuable insights into their resource needs, teaching challenges, and priorities for fostering student success. These responses highlighted areas where library support could better align with academic and professional goals. External benchmarking with engineering librarians at peer institutions provided a broader perspective on best practices and innovative approaches to supporting engineering education. The findings emphasized the importance of strengthening faculty-library partnerships to address these challenges effectively. By cultivating collaborative relationships, libraries can play a pivotal role in supporting faculty teaching goals while enhancing the educational experience for students. This partnership-driven approach paves the way for innovative instructional practices.

This paper emphasizes the transformative potential of faculty-library collaboration in fostering student-centered learning environments. By integrating high-impact educational practices with tailored library support, the project highlights the library's role as a strategic partner in engineering education. Practical recommendations will be provided for faculty seeking to leverage library expertise and resources to advance project-based learning, interdisciplinary collaboration, and student transitions from academia to industry. Through these partnerships, libraries can help faculty equip engineering students with the technical, professional, and research skills necessary for future success.

Introduction

The need for innovative teaching methods and support systems for engineering students and faculty has become paramount in correspondence with the swift advancements in technology. Project-based learning (PBL), which emphasizes hands-on, real-world problem-solving, has emerged as a cornerstone of engineering curricula because it equips students with technical and professional skills

fostering collaboration, creativity, and adaptability which are essential qualities for career success. However, effectively implementing PBL poses unique challenges for faculty and institutions, requiring tailored resources and support mechanisms. Academic libraries, with their expertise in information management, instructional support, and resource accessibility, are uniquely positioned to address these challenges and play a transformative role in engineering education.

This paper explores the findings of a project led by the engineering liaison for the University of North Texas (UNT) Libraries to enhance support for the College of Engineering (CENGR). The project focused on three core objectives: identifying essential library services and resources, enhancing support for PBL, and strengthening engagement with faculty and students. By employing qualitative and quantitative research methods, the project provides insights into the specific needs of CENGR students and faculty, highlighting opportunities for libraries to align their services more closely with academic and professional goals.

Through an analysis of survey data, external benchmarking, and faculty-library collaboration, this paper highlights the strategic role libraries can play in engineering education. By integrating library resources and expertise into faculty teaching practices, libraries can help foster student-centered learning environments that emphasize high-impact educational practices. This paper provides practical recommendations for faculty and librarians seeking to advance PBL, interdisciplinary collaboration, and the transition from academia to industry, illustrating how libraries can serve as key partners in engineering education.

Methodology

This project, funded by the UNT Libraries Dean's Innovation Grant, enabled the research team to determine how the STEM library and engineering liaison can better serve CENGR faculty and students.

The guiding research questions for this project are:

1) What liaison services and resources are needed to best meet the needs of Engineering students and faculty?
2) How can we better support PBL within engineering degree programs?
3) How can the UNT Libraries' engagement with CENGR students and faculty be improved?

With these questions in mind, the research team developed surveys and conducted interviews with the goal of answering these questions and informing future directions for the engineering liaison. Each survey was designed to gather insights specific to its audience, and rigorous data cleaning processes were applied to ensure the accuracy and relevance of the results. Faculty surveys and interviews included at least one representative from the majority of engineering disciplines, providing diverse perspectives on research and teaching support. The student survey included undergraduate, graduate, and doctoral students across all engineering majors, ensuring a

comprehensive understanding of student needs. Additionally, input from over 50 engineering librarians across the United States offered valuable benchmarking data, highlighting best practices and innovative approaches to engineering library services.

Interviews and Surveys

Conducted over one year, the research for this project entailed developing separate surveys for engineering students, faculty, and library professionals.

The research team developed nine faculty interview questions which sought feedback about ways in which the library could better support their teaching and students (Appendix). Two faculty members were interviewed. Due to low recruitment, we developed an online survey. The survey received 21 total responses from various degree programs.

The survey for engineering students consisted of ten questions and focused on preferred library support services for their coursework (Appendix). This survey received 387 complete responses.

The survey for engineering library professionals consisted of nine questions, relating to resources, instruction, and training that they use to support their engineering faculty and students at their institutions (Appendix). This survey received 51 complete responses.

Findings

The analysis of survey responses revealed insights into the needs and expectations of both students and faculty within the College of Engineering. The findings are organized into three primary themes: Engineering Resources, Engineering Services, and Engineering Liaison Support.

Theme 1: Engineering Resources

Survey data indicated a significant demand for specialized resources among engineering students. Over half of the respondents (52%) highlighted the need for lab manuals and guides, with more than 200 students expressing a preference for remote access to these resources. Additionally, there were requests by faculty for access to journals and articles that encompass broader engineering disciplines beyond technology, including seminal works. They also emphasized the importance of providing students with access to essential textbooks.

Theme 2: Engineering Services

Students expressed a strong desire for support during the planning and design phases of their projects, with 46% requesting resources and workshops tailored to these early stages. More than 300 students called for increased access to materials, tools, and workshops to assist with project execution. Faculty feedback also emphasized the need for workshops focused on research-related topics and PBL. Additionally, faculty identified a gap in support and outreach for their personal research, highlighting the necessity for enhanced services in these areas.

Theme 3: Engineering Liaison Support

Engineering librarians shared key resources and services they provide to faculty and students at their institutions. Resources included e-textbooks, access to technical standards, data management support, course guides, and Fundamentals of Engineering exam preparation materials. In terms of services, respondents emphasized the importance of workshops, classroom instruction, research assistance, technology training, departmental office hours, credit-based courses, and tutoring for foundational courses.

Discussion

Through our research and analysis, we identified key initiatives that will enhance student and faculty engagement with library resources. These initiatives focus on expanding access to services, providing targeted academic support, and offering personalized consultation opportunities. Together, these new resources will not only improve the accessibility and effectiveness of library services but also contribute to higher retention rates, academic achievement, and student success.
The request for enhanced support during the planning and execution phases of student projects reinforces the importance of integrating practical, skills-based workshops and services into library programming. Faculty also indicated that their students could benefit from additional support in project management and group collaboration, further highlighting the need for PBL support beyond the classroom. To fill this gap consultation services and tools focused on project design and planning were requested by students. Faculty also expressed a desire for library workshops that support their curriculum, but don't require in-class instruction from their liaison due to time constraints. While the library liaison currently provides workshops, the reach is limited and will require more faculty support to encourage student attendance. These workshops, which might cover topics such as design methodologies, prototyping, and research skills, will empower students to navigate the challenges of PBL more effectively. Project and presentation consultations will also be offered to help students plan projects and receive guidance on developing technical presentations.

To address the student preference for remote access to specialized resources for engineering coursework, the library is focused on expanding access to digital tools and textbooks that will directly address these needs, enabling students to work more flexibly and effectively. We have begun this process through enhancing our electronic resources to provide students with 24/7 access to e-textbooks, tutorials, handbooks, case studies, and professional exam prep materials. These enhancements also include resources for engineering instructors. Through diversifying and modernizing its resource offerings, the library seeks to establish itself as an academic partner to CENGR by aligning its collection development strategies with faculty and student priorities.

The role of engineering liaisons emerged as a cornerstone of spearheading these efforts by identifying gaps and establishing collaborative relationships. By offering specialized resources, liaisons can directly support engineering students' academic and professional growth. Similarly, the

development of targeted services, such as departmental office hours, credit-based courses, and tutoring for foundational courses, can address key pain points in the engineering curriculum, strengthening the liaison's role as both an academic and professional resource provider and increasing their contributions to student retention and success.

Moving Forward

To address the needs revealed through the surveys, the library will continue to maintain a proactive, user-centered approach. The liaison librarian will work to identify opportunities for integrating library resources into teaching through regularly engaging with faculty to identify emerging needs and align library services with their research and instructional goals. Piloting initiatives, such as the STEM library peer-to-peer tutoring program for foundational engineering courses, which will begin in the spring of 2025, will be a focus as we continue to determine the best ways to meet the needs of our engineering community. Most importantly, we will continue to assess and refine these services as we work toward improving student outcomes and collaborating with our engineering faculty to foster a culture of collaboration and innovation among students.

Conclusion

The findings of this project highlight the vital role that the collaboration of academic libraries and faculty can play in supporting the evolving needs of engineering education. By addressing critical gaps in resources, services, and engagement, libraries can enhance their contributions to PBL, faculty teaching, and student success. Through strategic initiatives such as expanding access to specialized resources, developing targeted workshops, and strengthening engineering liaison services, libraries can establish themselves as indispensable partners in engineering education.

Collaboration between faculty and librarians emerged as a central theme, highlighting the transformative potential of these partnerships. By aligning library offerings with faculty goals and student needs, libraries can help create a student-centered learning environment that integrates high-impact educational practices. These efforts not only advance academic achievement but also prepare students with the technical, professional, and research skills necessary to transition successfully into the workforce.

Looking ahead, the library’s role in engineering education must remain adaptive and forward-thinking. Continuous assessment, innovative programming, and strong faculty collaborations will ensure that library services stay aligned with the rapidly changing demands of engineering disciplines. By prioritizing these efforts, academic libraries can contribute meaningfully to the academic and professional success of engineering students, helping to shape the next generation of engineers.

Appendix

Engineering Faculty Interview/Survey Questions

1. In your experience, how do engineering students typically engage in practical and project-based learning as part of their coursework?

2. What role do you feel your subject librarian can play in supporting your students during practical and project-based learning activities?

3. Are there specific challenges or gaps you've observed in the library's support for the engineering curriculum?

4. What do you like about the support the library currently provides for yourself and your students?

5. How do you envision the ideal collaboration between the library and engineering faculty in supporting project-based learning?

6. What kind of research support or resources do you believe would be most beneficial for engineering students?

7. What resources or services would be most beneficial for project-based learning?

8. Are there any specific tools, materials, or technology you believe the library should make available to enhance students' learning in engineering?

9. How can your subject librarian assist your students with group or team projects, especially regarding project management, resource access, and access to collaborative spaces?

10. Do you have any other feedback or comments you would like to share?

Engineering Student Survey Questions

How often do you engage in hands-on, practical projects or experiments as part of your engineering coursework?

- Daily
- Weekly
- Monthly
- At least once a semester
- Never

What type of resources do you typically need to support your engineering studies?

- Lab manuals and guides
- Prototyping materials
- Technical manuals and data sheets
- 3D printing or fabrication resources
- Specialized software
- Standards and patents research
- Other (please specify)

How do you prefer to access engineering resources?

- In-person, within the library or a physical lab
- Online, through the library's website or online databases
- A combination of in-person and online resources
- I don't typically use resources for coursework

Which of the following support services would you find most beneficial for your engineering projects? (Select all that apply.)

- Access to specialized project materials and equipment (please specify)
- Workshops on project planning and execution
- Guidance on prototyping and testing
- Other (please specify)

How important is it for you to have access to project-specific materials and tools within the library or on campus?

- Very important
- Important
- Neutral
- Not very important
- Not important at all

Are there specific times or phases of your projects when you would benefit most from access to project-specific resources and services?

- During project planning and design
- During the prototyping or testing phase
- During project presentation and documentation
- Throughout the entire project lifecycle
- I don't need access to project-specific resources

Do you have any suggestions for how your engineering librarian can better supporting your learning endeavors? (open-ended)

Engineering Liaison Survey

What engineering-specific resources and services does your library offer to support engineering students and faculty? (Select all that apply.)

- Access to engineering databases and journals
- Technical research guides and tutorials
- Specialized engineering collections
- Equipment and tools for engineering projects
- Instruction sessions
- Workshops and training sessions for students
- Research assistance/consultations
- Specialized software
- Other (please specify)

How do you stay updated on the evolving needs of engineering students and faculty at your institution? (Select all that apply.)

- Regular feedback surveys
- Faculty and student advisory committees
- Direct communication and collaboration
- Monitoring the academic curriculum and program requirements
- Other (please specify)

What have been your most significant challenges in supporting engineering students and faculty?

- Limited budget and resources
- Keeping up with evolving technology and resources
- Ensuring relevant and up-to-date collections
- Fostering awareness and engagement
- Other (please specify)

How do you collaborate with faculty members to support their teaching and research? (Select all that apply.)

- Embedding library resources in course materials

- Providing tailored research instruction sessions
- Assisting with the identification of course materials and readings
- Collaborating on research projects
- Other (please specify)

What type of initiatives or programs have you found to be most effective in promoting engineering library services to students and Faculty?

- Workshops or seminars
- Outreach events and fairs
- Online resources and guides
- Promotional materials or campaigns
- Other (please specify)

Are there any best practices or innovative approaches your library has adopted to enhance the support provided to engineering students and faculty?

- Yes, please describe.
- No

What additional resources, support, or training have you found helpful for assisting engineering students and faculty in your role as an engineering librarian? (open-ended)

Do you have any other suggestions for engineering liaison services?