Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #45980

# The Complementary Relationship between Facilitators and Professors in a Practice-based Engineering Program

**Cody Mann, Minnesota State University, Mankato**

Working with Minnesota State University, Mankato to deliver an innovative, co-op-based engineering education program called the Iron Range Engineering Bell Program. Graduated with a Bachelor of Science in Engineering degree through Iron Range Engineering - Minnesota State University, Mankato, and a Master of Engineering degree through the University of Minnesota Duluth

**Dr. Darcie Christensen, Minnesota State University, Mankato**

Dr. Darcie Christensen is a probationary Assistant Professor in the Department of Integrated Engineering at Minnesota State University Mankato. She teaches for Iron Range Engineering, which is a co-op based engineering program in Virginia, MN. Dr. Christensen received her Ph.D. in Engineering Education from Utah State University in the Summer of 2021. The title of her Dissertation was ”A Mixed-Method Approach to Explore Student Needs for Peer Mentoring in a College of Engineering.” Darcie holds a Master of Engineering degree in Environmental Engineering (2019) and Bachelor of Science degree in Biological Engineering (2017), both from Utah State University. She is passionate about student success and support, both inside and outside of the classroom.

**Mr. Andrew Lillesve, Minnesota State University, Mankato**

Andrew Lillesve is originally from Grand Rapids, Minnesota. After high school he attended the Itasca Community College Engineering Program until 2006, at which point he moved to Houghton, Michigan. There finished his Bachelor’s degree in Mechanical Engine

**Luke John Nyberg**

# The Complementary Relationship between Facilitators and Professors in a Practice-based Engineering Program


## Abstract

It is well known that faculty and staff roles are critical in higher education. A work-based learning model in undergraduate engineering education at a Midwest university of higher education offers a unique blend of student-facing support that cuts across both groups of faculty and staff. Tenure-track professors and adjuncts serve as the faculty members of this practice-based program, while the staff is largely made up of facilitators. Professors and facilitators have specific responsibilities that differentiate them from each other. For example, professors are solely responsible for teaching all technical content courses. Facilitators are staff members who possess degrees in engineering, often have industry experience, and serve primarily as learning coaches and mentors, especially in the design and professionalism space. However, there are many shared responsibilities that exist to create a supportive environment for students who are in various locations around the world working in full-time co-op positions or research projects while simultaneously completing the final two years of a bachelor's degree as full-time students.

The aim of this paper is twofold: (1) to give the background and frame the positions of both facilitators and professors, emphasizing their complementary roles, and (2) to analyze responses from students, professors, directors, and facilitators to determine what their perception is of the interaction and collaboration of these positions. This is because a support model like this is the first of its kind and is unique, not found in the same capacity elsewhere in the world of academia. Based on its history of success, similar models are beginning to be implemented at other programs and institutions. Because of this, it is important that the roles of those supporting the program are formalized and analyzed since they have not previously been shared in this fashion. This will provide a definition of the structure as well as an illustration of the personal aspects of experiencing these roles from various perspectives.


## Background

### *Co-Op/Work-based models*

Practice-based models are beginning to evolve and change the approach to a more holistic engineering education experience. Education programs are being designed to provide students with the knowledge and competencies that align with the needs of the workforce [1]. Work-based learning, a specific subset of practice-based learning models, in Higher Education has become a complex system of learning for students seeking to receive university-level credit while also being able to acquire necessary skills from the workplace. It requires strong social contributions and personal connections from employers, academic staff, and faculty members to

result in a successful learning experience for students [2]. Work-based learning is a two-way bridge between the university classroom and the workplace, where this community of people works cooperatively to provide resources and various learning environments for students to find and develop their career potential [3-4]. The “co-op” model is often used interchangeably with the “work-based” model to describe the cooperative approach to education. There are straightforward benefits to work-based learning programs, such as attracting different demographics of students like non-traditional and those without formal qualifications [5], receiving paid employment opportunities while obtaining a degree [6], providing real learning experiences that tie to theoretical academic learning [3], and sharing knowledge more effectively between industry experts, professors in academia, and students [4].

However, some barriers exist that interfere with the ability of traditional academic programs to implement a practice-based model. This includes a perception of limited availability of resources and a lack of willing employers [6]. Nonetheless, there are ways to address these limitations. Studies have been performed to identify ways to increase student engagement and attainment while also improving overall satisfaction amongst students and employers who are involved in work-based learning programs. One of the ways to achieve this is through the strong collaboration of academic staff and faculty. They work together to provide resources and focus on students’ development of communication skills and other transferable skills throughout their work-based learning experience [5] in conjunction with their technical learning.

*Iron Range Engineering (IRE)*

Iron Range Engineering is an upper-division (i.e., last two years of undergraduate education) engineering program, which started out as a project-based learning program [7]. The program has evolved into a work-based learning model where full-time students typically are working 40-45 hours per week for a minimum of four semesters while pursuing their bachelor’s degree in engineering. It is housed within an Integrated Engineering Department. To prepare for their work as student engineers, the students have a transition semester between their community college experiences and work called the Bell Academy, where they are prepared in technical, professional, and design competencies [8]. These three branches remain the core of the curriculum throughout the program.

To support students in their learning in these three curricular branches, faculty and staff work together to ensure ABET learning outcomes are met, and students are adequately prepared to be working engineers who will be physically distanced from their academic community. Some roles are distinctly delegated to faculty members, some roles are distinctly delegated to staff, and multiple roles are shared between the two. Further explanation of who makes up the faculty, staff, and administration will be described in the following sections along with their distinct and shared roles. The following descriptions of these distinct and shared duty roles are those that are

directly student-facing. These are not meant to be comprehensive lists of all duties since there are examples of things that are missing (e.g., scholarly work, professional development). Still, they begin to give a scope of the unique nature of the way these roles function within Iron Range Engineering.

*Faculty*

At Iron Range Engineering, the technical content delivery is done primarily by nine Ph.D.-holding, tenure-track faculty members. They are supported by seven additional faculty members who are either part-time, adjunct, or teaching staff on a non-tenure track. For the sake of this study, we will refer to this category generally as "faculty" or "professors". Faculty teach technical competencies (e.g., Fluid Mechanics, Electronics, Engineering Economics, etc.) in 1-credit blocks each semester. These technical competencies include both core and elective courses that are necessary for the completion of the general engineering degree. Additionally, the faculty help deliver professionalism and design learning through workshops, seminars, assessments, feedback, etc. Faculty are responsible for all instructor-of-record duties associated with the courses for technical, design, and professionalism learning.

The tenure-track faculty members are also responsible for advising students in their academic pathway. They ensure students are meeting transfer requirements, pacing themselves sustainably for graduation, taking the correct courses for graduation, etc. Students meet with their academic advisor at least once per semester, but it can be multiple times. Advisors typically oversee between 20-35 advisees at any given time.

*Staff*

<u>Facilitators</u>

The facilitator role within Iron Range Engineering (IRE) is perhaps the most unique staff position within academia. The facilitator role officially falls within the staff designation but is a careful combination of traditional university faculty and staff positions. Broadly speaking, staff positions within traditional academia are not, of necessity, directly student-facing but are task-oriented toward organization and governance. While IRE facilitators perform many of the organizational aspects that an individual in a traditional support staff position engages in, what sets them apart from the more neatly constrained staff roles in traditional academia is that IRE facilitators' primary responsibility is intentionally student-facing mentorship. Due to this primary responsibility of IRE facilitators, these staff members' roles, responsibilities, and duties are guided by an intentional value orientation toward student success on an interpersonal level.

The following list is the facilitator's primary, student-facing responsibilities that are unique to the facilitator role. Each responsibility subheading has been broadly defined and can be further

granulated, modified, reduced, or expanded within the organization based on the individual facilitator's passions, skill sets, knowledge base, and innate abilities. Job roles within IRE are broadly defined in order to give space for individual employees to work within the sphere in which they feel they are most equipped to contribute substantial value while also giving the employee autonomy and a sense of ownership over the unique educational model, including program culture and student success.

Enrollment development

Broadly defined, this responsibility predominately relates to direct student recruitment. However, enrollment development is much more multifaceted than direct recruitment alone. While many program facilitators travel to community colleges around the United States to present directly to pre-engineering classes, the task of recruitment within IRE is also seen as a task performed in-state and onsite. This type of enrollment development is performed through engagement with potential students during campus visits, in local high school outreach events, interacting with potential students and their family members, and facilitating virtual campus visits through Zoom. Recruitment may also include encouraging current enrolled students to represent the program within the students' professional and personal networks and their community college alumni associations.

This task is vitally important for the economic sustainability and growth of the program. Most importantly, these recruiting events give our program an opportunity to engage and connect *personally* with individuals' intent on enrolling with us. This connection often sets the stage for a student's proper mindset, inflames the student's passion for engineering, and, when done properly, can set the student on the path toward maximum success within academia and industry. This requires maintaining a mindset that sees each potential student as an individual, someone with aspirations, goals, and a history already established that informs who they are. Recruitment for the program is not a sales pitch, but an integral part of the program's focus on maximizing student success as they define it.

Tutoring & Mentoring Students in Professionalism & Design

Professionalism and Design are the primary curricular zones where facilitators perform their mentoring duties. Professionalism, as used by IRE, is a broad term for nearly all social aspects of professional life and includes ethical, anthropological, leadership, well-being, learning, and personal and professional development instruction. The Design zone includes instruction in creativity, application of technical learning, the design process, teamwork, communication, and managing interpersonal conflict.

This tutoring and mentoring role for facilitators is similar to apprenticeship models in other fields where new students are guided or shepherded within their chosen vocation by individuals with experience outside the academic realm. Mentoring requires the ability to dole out timely,

relevant, individualized, honest, yet empathetic advice that is delivered in a winsome manner. Facilitators take an active interest in their students' professional and personal lives, serving as what is called a “learning coach.” Facilitators schedule a minimum of bi-weekly meetings with each student to check in on their academic and employment progress while also checking on the personal well-being of the student. This is done throughout the students’ tenure in the program, both during their preparatory and work-based semesters. These conversations depend largely on the student’s willingness to be open and honest, although the mentor’s facilitation abilities can foster this. Facilitators must employ conversational skills while applying their reflective capabilities to build a connection based on trust. It is essential that the students believe that the facilitator has their best interests at heart.

Mentoring by facilitators goes beyond weekly one-on-one meetings. Facilitators help students to give context and connection to their learning in technical competencies. Facilitators are supervisors for student projects in their preparatory semester. These student projects are solving real-world problems sponsored by local companies with the intent of giving students experience working with industry. Properly trained, a facilitator engaged in all these activities will approach all student engagement with an eye towards identifying “teachable moments” while also endeavoring to exemplify the profession's highest ideals while also being approachable, respectable, and inspirational.

Organizing Student Life Events

Building community is an essential aspect of quality education. Facilitators at IRE are often tasked with organizing and leading many student-life and professional development activities during the semester and at the end-of-semester graduation celebrations. These include both in-person and virtual opportunities for the entire population, which may include movie nights, barbecues, kayaking trips, hockey games, etc. The duty of the facilitator in the planning and execution of these events is to exemplify the highest ideals of leadership, collaboration, and competency. The fostering and exemplifying of these ideals are paramount because they set the tone for the entire community and display its lived-out values. Likewise, when a facilitator falls short or otherwise makes a mistake, as is inevitable, in any one of these areas in the planning or leading of an event, the facilitator must not only show the qualities of humility, contrition, and ownership of the mistakes but also show how the professional approaches and deals with failure openly and honestly. This intentional display of the expected lived-out values the program seeks to inculcate in its students fosters a tone within the community that failure is acceptable, but not learning and growing from it is unacceptable.

Industry Liaison

Iron Range Engineering prides itself on delivering an educational model that aligns with what the engineering industry needs and wants from its engineering employees. Most facilitators have come out of the engineering industry, which is essential for building and maintaining the

program's relationship with various companies. Without this strong connection, many people in industry responsible for hiring their company's workforce will often be unfamiliar with a work-based model. They are usually familiar with the traditional three to four-month internships, not six-month or longer employment stints by their student engineers. Therefore, facilitators step in to fill this gap in industry knowledge through industry outreach by providing company presentations, speaking with hiring managers, attending job fairs, and using their professional network to inform and help obtain co-op positions for the students in the program.

Facilitators also continue the program's relationship with the companies that hire its students by communicating the program's expectations of our students and routinely checking with the students' supervisors on the student's development, productivity, and behavior while on the job.

Team of Directors & Support Staff

Outside the professor and facilitator positions at Iron Range Engineering (IRE), there are director and support staff positions. These positions consist of a Director of Academics, a Director of Student Success, a Director of Operations, and a Senior Administrative Assistant. The director positions support and guide the many leadership roles and responsibilities that the professors and facilitators take on at IRE. The collective team of directors works collaboratively with both professors and facilitators to continuously improve the curriculum and the program operations strategies. The directors of IRE also provide oversight and guidance on the operating budget, accreditation standing, assessment calibration, and student support needed to succeed in their engineering education and careers.

The team of directors makes decisions regarding personnel and non-personnel expenses, which includes overseeing and managing the recruiting and marketing efforts to broaden the diversity of the engineering profession and foster engineering education innovation. This also includes facility-based decisions regarding space utilization, equipment purchases, lab upgrades & repairs, and housing supplies. Another key aspect of the team of directors is to continuously improve and manage student success initiatives, including community building, identity formation, inclusion, and implementation of processes to guide students who may need additional support. The Senior Administrative Assistant supports all these functions by gathering, analyzing, and monitoring pertinent data. The valuable work of this role leads to an increased level of organization and provides the information necessary to make decisions.

*Shared Duties*

While professors and facilitators have separate roles at Iron Range Engineering, some responsibilities overlap. These duties are student or community-facing. Among them are overall student support, managing student life events, teaching and assessing student design and professional work, and career development. In order to handle these tasks, sub-teams were

created comprised of a combination of faculty and professors. Some tasks these teams take on can be completed among their team members. Other tasks require a collaboration of the entire faculty and staff, which are designated as “All-Staff” events. Each person’s involvement in the All-Staff events is determined based on their workload and individual duties.

Recruiting and Marketing

As mentioned in the facilitator section, facilitators primarily lead recruiting efforts. As part of these recruiting efforts, though, an all-staff effort may be needed to help with recruiting events, such as when prospective students visit our campus to answer any questions, see the facilities, and meet the staff. During these visits, students speak with facilitators and professors to get their perspectives on the program. While all faculty and staff members meet with the students, facilitators typically plan the visits.

Career Development

Faculty and staff participate in facilitating career development sessions throughout the course of the semester to help students prepare their career showcase materials, termed the “jobs package.” This includes resumes, cover letters, and interview skills practiced during mock interviews. All faculty and staff members assist with this endeavor by facilitating working sessions and providing feedback. Students set out to become expert job seekers, and they learn the necessary skills for building a professional network. While students are doing all their own job searching (i.e., they are not “placed” in work-based experiences), a career development sub-team plans both local and virtual career fairs to support the students’ efforts. An increased number of job opportunities come from helping students make personal connections with working professionals looking to hire interns and student co-ops to expand their teams and grow their companies. This includes establishing relationships and following up by encouraging students to make phone calls, send emails, and connect on online platforms (such as LinkedIn).

Co-Leading Student Life

To build the community, IRE routinely hosts student life events that faculty, staff, and students attend. This is particularly important due to being separate from the main campus and having many remote students. These events are planned by a student life sub-team and delivered by all members of the community. The co-leading of these events allows students to form deeper connections with both professors and facilitators outside of the typical learning environments.

Design and Professionalism Instruction & Assessment

Throughout their IRE experience, students are presented with design and professionalism instruction to develop their skills in these areas. While getting real-time experience in their engineering work, they need support in learning to navigate the ins and outs of the profession. All staff and faculty members select workshops and assessments based on their expertise and interest levels. The instruction in these spaces is delivered in various formats, including interactive live seminar sessions, workshops, podcast content [9], and videos. In order to assess their learning in these areas, a variety of methods are utilized. They write papers that include both literature reviews on the areas and reflecting on how their personal experience connects, complete learning journals on various design and professionalism topics, record videos of them explaining their identity formation as an engineer, and many more. Capstone assessments for the semester are also included in the realms of systems engineering, co-op/project experience, and public speaking. Professors and facilitators divide the duties of assessing these deliverables for both content and delivery, offering constructive feedback on how to learn and grow in these skills and connecting them to their current work.

Program Development & Assessment

There are numerous ways in which all faculty and staff engage with and take ownership of the program's educational model. Their most overt inclusion is through departmental and program-specific continuous improvement meetings or “summits” that occur at the end of each semester. These semester closure meetings are, in essence, brainstorming sessions that include all faculty and staff. The discussion topics in such meetings entirely focus on what the program did for the students, whether it was effective or ineffective in preparing students for the industry, both technically, professionally, and in design skills. These meetings contain no hierarchies, do not differentiate between ideas proposed by faculty or staff, and are solely geared toward looking at ourselves with open and honest assessment. Student feedback from the semester is also weighed into all decision-making.

While summits are a good capstone experience for the semester, weekly “divergent thinking” sessions are held, and all staff and faculty are invited to participate. These weekly sessions discuss ideas focusing on future improvements, big and small. Everything from practical ideas in recruiting techniques and information dissemination to implementing and applying theories in education, autonomy, and student well-being have been included as topics at some point. At least one action item results from each divergent thinking session.

Furthermore, faculty and staff are working together on research efforts, attending engineering education conferences and working on disseminating findings from our unique model. Faculty and staff are also involved in the hiring processes for new faculty and staff, and are encouraged to voice concerns, advocate for student success, guide and lead the design curriculum, and are

involved in nearly all areas of academic and programmatic development in conjunction with the Directors.

**Analysis**

The analysis in this paper is a subset of a larger study focused on determining how the roles of facilitators and professors are defined and perceived within the context of Iron Range Engineering's practice-based model, including the collaboration and benefits of these roles. Data for this study were obtained from a survey distributed to all faculty, staff, directors, and students (~140 potential participants) at Iron Range Engineering. This was done through both oral invitations to meetings and seminars as well as through email within a two-week period. Of the 42 participants who began the survey, 30 participants completed it. The survey contained six qualitative questions focused on defining the role of professors and facilitators in the work-based engineering program of focus. Demographic information was also obtained. All study procedures were approved by the Minnesota State University, Mankato Institutional Review Board (IRB).

The focus of the sub-study was to answer the following research question: ***how do professors, facilitators, directors, and students perceive the complementary nature of the professor and facilitator roles?*** In order to determine the answer to this question, the responses from students ("S", n=15), professors ("P", n=7), facilitators ("F", n=7), and directors ("D", n=1) for the following questions were examined:

- What does the interaction of professors and facilitators look like to you?
- How would you describe the nature of the collaboration between professors and facilitators?

Because n=1 for directors, their response was compiled into the professor's responses since their background and job duties most closely align with the faculty group. The 30 responses for each of the questions were read through by two of the members of the research team, highlighting key phrases within the responses that would answer the research question. Themes were then generated from these phrases, and both coders coded the question responses separately. The application of codes was then compared between the two, and one set of coding was agreed upon by the team for the responses. The coding categories and their frequency are shown in Table 1. All responses were copied verbatim from the survey. A code could be applied more than once within a participant's response to a given question. Multiple codes could also be applied to a participant's response to the questions.

Table 1. Summary table for the qualitative coding showing code summaries, examples, and frequencies.

| **Code Summary** | **Code Example** | **Frequency** |
|---|---|---|
| Focused on the **what or why** of the interaction or collaboration between professors and facilitators | ● work in tandem for student success (1P)<br>● discussing many different topics relating to students, staff, the university, and training (5F)<br>● share alot and try to resolve issues (7S) | P = 9<br>F = 9<br>S = 22<br>Total = 40 |
| Focused on the **when or where** the interaction or collaboration happens between professors and facilitators | ● collaborating on specific teams or projects, or by participating in "all-hands" events together. (5P)<br>● teams we work on together (1F)<br>● occurred during meetings or discussions not visible to students. (14S) | P = 9<br>F = 8<br>S = 9<br>Total = 26 |
| Focused on **general descriptions or keywords** describing the interaction or collaboration between professors and facilitators | ● Crucial (4P)<br>● work hand in hand (6F)<br>● productive and supportive (14S) | P = 7<br>F = 6<br>S = 11<br>Total = 24 |
| Focused on the **distinct roles or job duties** of professors and facilitators | ● different perspectives (1P & 2P)<br>● Both groups support the students in slightly different ways (2F)<br>● professors are the technical experts while the facilitators see the overall picture and maintain the program relevance. (6S) | P = 3<br>F = 3<br>S = 10<br>Total = 16 |
| Focused on the **limited collaboration and held negative connotations** relating to the interaction or collaboration between professors and facilitators | ● Limited (4P)<br>● very light (4F)<br>● On-site, while their direct interactions seemed limited (14S) | P = 3<br>F = 3<br>S = 4<br>Total = 10 |
| Focused on **future thinking and suggestions** for the interaction or collaboration between professors and facilitators | ● Could be better developed (4P)<br>● Ideally much more connected and collaborative, more lab use in tech classes which could be connected to facilitators helping (4F)<br>● Ideally, they would be in close coordination. (4S) | P = 2<br>F = 2<br>S = 1<br>Total = 5 |

**Results**

The most frequent coding category, as shown in Table 1, was the **what or why,** with 40 total mentions. Across Professors, Facilitators, and Students, responses were primarily focused on student success; for example, working "as a team to help students develop holistically as engineers" (3P), working "together to serve our students" (2F), and working in a "dynamic partnership centered on supporting student learning" (14S). Summarized well by a facilitator, the why of professors and facilitators is to provide "holistic support for students in all areas of their education, cooperative learning, and professionalism" (7F). Continuous improvement for the program was also brought up across all three groups. For example, a professor mentioned "program level improvement" (7P), a facilitator mentioned a "focus on making existing processes better and creating new ones to enhance the IRE experience" (1F), and a student said it is "people trying to figure out how to make a learning system work better each day" (9S). One unique mention by students was the collaboration of facilitators and professors helping them in getting "consistent advice and information" (12S) advice, help in "personal and professional decisions" (13S), and receipt of "clear and accurate guidance" (14S), supported well by "an open door policy that create an inviting environment" (12S) and a willingness to refer students to the other group if they don't know the answer (14S).

The next highest frequency category was the mention of **when or where** the collaboration between facilitators and professors occurs. Professors and facilitators in these responses focused on both formal and informal means of when or where their collaborations happened, which are summarized in Table 2.

Table 2. Summary of the **when or where** participant responses for professors and facilitators.

| Informal | Formal |
|---|---|
| ● Email (1P, 4F)<br>● Personal conversations (1P, 2P)<br>● Divergent Thinking walking sessions (7P)<br>● Student of concern collaboration (7P)<br>● Open line of communication (6F,)<br>● Continuous improvement discussions (7F) | ● Zoom meetings (1P, 3S)<br>● Department search committees (2P)<br>● Research (2P, 7F)<br>● Department and/or Program Teams/Projects (2P, 5P, 6P, 1F, 2F, 4F)<br>● Staff Meetings (4P, 6P, 8P, 4F, 5F, 6F)<br>● Intersection of Design, Professionalism, and Seminar activities (7P)<br>● Facility Management (7P)<br>● Student-Led Advanced (SLA) courses (1F) |

Students had a slightly different approach to explaining the when or where of collaboration, focusing more on student-facing interactions and events or keeping more general explanations, such as:

- Zoom, text, or call (3S)
- Podcast segments (8S)
- EngFest! (8S)
- Constant communication about expectations (12S)
- Frequent interactions (13S)
- Meetings or discussions not visible to students (14S)

The word cloud shown in Figure 1 gives a summary of the **general descriptions or keywords** that describe the interaction or collaboration of professors and facilitators as given by students, facilitators, and professors. The size of each word relates to the frequency of mention in the responses.

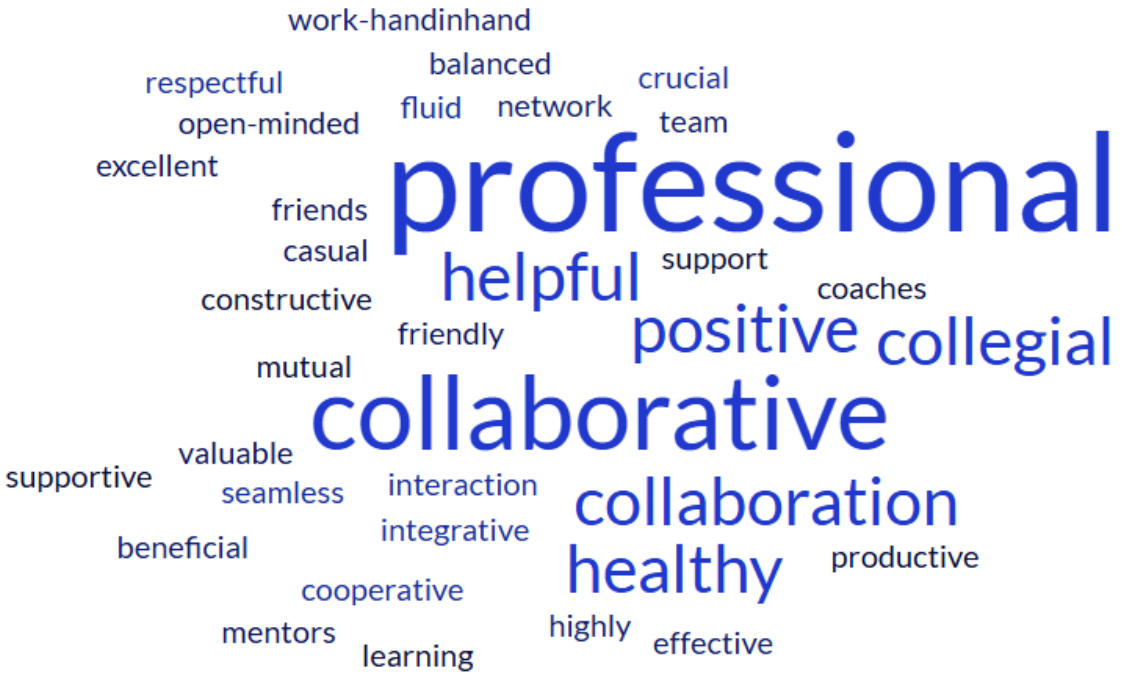


Figure 1. Word cloud generation from the general descriptions and keywords given by professors, facilitators, and students [10].

Especially for students, the **distinct roles or job duties** of facilitators and professors came up. While both professors and facilitators brought up the “different perspectives” (1P & 2P), “diverse cultural and personal norms” (7P), and each group taking on different aspects of the program” (2F), students stated, “sometimes it seems like two separate units in different rooms that don’t directly work together” (3S) and “generally stay in their own realm” (4S). Multiple

students brought up that professors are focused on helping in the technical realm (6S, 8S, 10S, 11S, 11S), and facilitators are more focused on the program as a whole, professionalism, and application of learning, mediating between the different aspects of their academic learning (6S, 8S,11S).

Another coding category focused on **limited collaboration or held negative connotations.** Responses in this category raised issues with unclear role expectations, noting a "lack of full understanding between individuals in the two different roles" (2P). This view was not limited to professors and facilitators. One student commented on the roles, saying the "line between them is blurred sometimes" (4S).

Even when responsibilities were clear, some staff members commented on a lack of collaboration with other roles, finding it to be "limited" (4P), "very light" (4F), and "disjointed as a whole" (8P). One student agreed with those viewpoints, responding, "I've seen nothing specific of that collaboration" (15S). Another student mentioned that "on-site…their direct interactions seemed limited" (14S).

Other negative terms refer to the collaboration between roles focused on unclear group communication. One respondent commented that "communication between the roles and sub-teams could be improved" (2F), while another respondent stated further that "Sometimes, I think we each think the other is handling something" (4F), perhaps again alluding to unclear role expectations.

While the least frequently mentioned category, **future thinking and suggestions** for the interaction or collaboration between professors and facilitators had worthwhile connections of where to go from here. This generally included the idea that facilitators and professors "would be in close coordination" (4S) and "much more connected and collaborative" (4F).

**Discussion & Implications**

All the different perspectives have provided more insight that warrants further discussion and follow-up. Students associate with professors primarily with technical expertise and connect facilitators more for professional guidance, design learning, and program support functions. It's clear that the complementary roles aren't always visible to students, but they understand they must happen at some level. This may be because there are not a lot of instances where facilitators and professors work together in front of students except in live seminars and podcasts. This was also evidenced by students only talking about when/where aspects of collaboration in 9 occurrences, which were general statements for the most part. Regardless of their perception, students generally felt supported by the combination of professors and facilitators.

Professors and facilitators also generally felt that they were working together with the primary goal of supporting students, though they had unique perspectives as well, including the program management side that students may not see. While mostly positive, some felt their collaboration time was limited and regulated to staff meetings and emails. Some also described a lack of understanding of the other's roles. Many think collaboration could be improved, as it lacks some crucial elements. This warrants further exploration in the future of the other survey questions on the instrument, which include the definition of both professor and facilitator roles as perceived by themselves and students.

These differences in the perspectives between students, faculty, and staff could be attributed to the high importance professors and facilitators place on meaningful collaboration. This includes the mindset of continuous improvement on the one side, whereas the students witness primarily student-facing events where the collaboration takes place. The implications of this are that if the professors and facilitators don't work together to understand one another better and find additional places to collaborate, it could be detrimental to the connections made with the students.

Limitations of this study largely result from the fact that it is that it is solely a self-study. The researchers' roles within the program might have influenced the coding and interpretation of responses. An external research team could help mitigate this concern in the future. It was also a low response rate, leading to small sub-groups, limiting the robustness of the conclusions and the transferability to other programs. Future work could include exploring how this student support compares to other institutional models that do not have both facilitators and professors supporting students to determine further the strengths and weaknesses of the model. Future work could also include the addition of quantitative metrics (e.g., retention rates, graduation rates, job placement statistics, etc.) to demonstrate more fully the benefits of the model based on a more thorough, mixed-methods evaluation.

Based on the findings above, regardless of the current model of faculty, staff, and administration in a given institution, it is recommended that other institutions consider assessing and developing the collaboration between their faculty and staff members to ensure that they continue improving the student's overall experience and levels of satisfaction of all stakeholders. As shown here, it can be difficult to take full advantage of potential collaborations that can provide student support but is worth the effort since the collaboration "seems to foster a healthy and collaborative environment conducive to student success" (14S).

## Conclusion

Upon reflection on facilitator, professor, and student perceptions, two takeaways are worth highlighting to conclude this paper. The first is that the student-facing persona of collegial collaboration has effectively communicated a strong support network for students. The second is that more work can be done to solidify these relationships in a more concrete and intentional

manner that is transferable to different academic models. Collaboration is critical in helping students stay connected and engaged while providing them with adequate resources to continue developing as engineers.

**References**


[1] Jalinus, N., Syahril, Haq, S., & Kassymova, G. K. (2023). Work-based learning for the engineering field in vocational education: Understanding concepts, principles and best practices. *Journal of Engineering Researcher and Lecturer*, *2*(1), 9–17. https://doi.org/10.58712/jerel.v2i1.22

[2] Finn, F. L. (2020). Investigating work-based learning influences, outcomes and sustainability: A conceptual model. *Work Based Learning E-Journal*, *9*(1).

[3] Ismail, S., Mohamad, M. M., Omar, N., Heong, Y. M., & Kiong, T. T. (2015). A comparison of the work-based learning models and implementation in training institutions. *Procedia - Social and Behavioral Sciences*, *204*, 282–289. https://doi.org/10.1016/j.sbspro.2015.08.153

[4] Ismail, S., Mohamad, M. M., Sofurah, N., & Faiz, M. (2021). A tie between educational institution and industry: A case study of benefit from work-based learning. *JOURNAL OF TECHNICAL EDUCATION AND TRAINING*, *13*(1), 128–138. https://doi.org/10.30880/jtet

[5] Doss, T. P., Allett, N. F., Woods, G. J., Poursharif, G., & Knight, G. L. (2021). Effective measures of tailored learning support for engineering work-based learners in HE: A case study. *Higher Education Pedagogies*, *6*(1), 66–78. https://doi.org/10.1080/23752696.2021.1882327

[6] Bromley, K. W., Hirano, K., Kittelman, A., Mazzotti, V. L., & McCroskey, C. (2022). Barriers to work-based learning experiences: A mixed methods study of perceptions from the field. *Journal of Vocational Rehabilitation*, *56*(1), 17–27. https://doi.org/10.3233/JVR-211169

[7] Ulseth, R. (2016). *Self-Directed Learning in PBL* [Ph.D. Dissertation, Aalborg University]. https://doi.org/10.5278/vbn.phd.engsci.00091

[8] Christensen, D., Singelmann, L., Mann, C., Johnson, B., & Ulseth, R. (2023). The Bell Academy: A Bridge Semester Where Engineering Students Transform Into Student Engineers Who Thrive in Industry Placements (Practice Paper). *SEFI 2023 Conference Proceedings*.

[9] Iron Range Engineering (Host). (2022-2025). *Around the Helix: Powered by Iron Range Engineering* [Audio Podcast]. https://open.spotify.com/show/4bpjvnZc1uDP9TrbjnKN0i?si=bfea243eda2c4a49

[10] *Free Word Cloud Generator*. (2021). https://www.freewordcloudgenerator.com/generatewordcloud