

Professional Competency Development through Reflection (Work-in-Progress)

Laurie Sutch, University of Michigan

Laurie is an experienced administrator in higher education as a director and program manager, workshop presenter, and facilitator of interactive learning experiences. Currently in the College of Engineering Undergraduate Education office at the University of Michigan, she supervises Spire, a program designed to help students develop professional competencies such as teamwork, communication, etc. She has presented at a variety of conferences, and has published several articles on gameful competency development, technology and campus collaboration, as well as developing leadership skills. She participated in the CLIR/EDUCAUSE Leading Change Institute in 2014.

Professional Competency Development Through Reflection (Work-in-Progress)

Introduction

Students attend college for a variety of reasons - particularly for engineering undergraduates, it is to learn the technical skills that will form the knowledge base they will use throughout their entire careers. However - whether they know it or not - they are also gaining non-technical, professional skills through their experiences both inside and outside of the classroom. Helping students consciously develop and hone these professional competencies is the goal of one new program at the University of Michigan College of Engineering (Michigan Engineering).

Michigan Engineering has been collaborating with a campus-wide unit called the Center for Academic Innovation to create and implement an online platform that provides a mechanism for students to track and reflect on the professional competencies (communication, leadership, teamwork, etc.) they are gaining through their experiences both inside and outside of the classroom, particularly experiential learning opportunities. Through this tool, students choose specific competencies to focus on, find or create experience opportunities, reflect on the growth that results from these experiences, and learn to articulate their skills in ways that will resonate with employers.

Background

As part of the College of Engineering's strategic visioning in 2018, one of the areas of focus was experiential learning [1-3]. The team researched the impact of experiential learning, surveyed faculty activity related to experiential learning, and scanned the landscape of experiential learning opportunities for students. One of the important things the team found was that there were a lot of - and a wide variety of - experiential learning opportunities for students. Additionally, over 95% of graduating seniors reported involvement with at least one type of experience, so adding more possible experiences didn't seem to be the issue.

At the same time, it was becoming clear that students weren't necessarily taking the time to stop and reflect on the professional skills/competencies they were gaining from these experiences. Informal employer feedback indicates that non-technical competencies are important, and many research studies, job outlooks, etc. support this [4-6]. However, employers also stated that many students couldn't make the connections between their experiences and these professional skills.

As a result of this work, the College created an [Experiential Learning Framework](#) (ELF) [1] that identifies 12 professional competencies important to the successful development of today's engineers. These competencies were chosen after extensive research [7] including the new ABET student outcomes criteria, national organization reports, a student report, the college's strategic visioning report, and competencies identified by the college's experiential learning program directors.

Within each competency, there are three or four dimensions, similar to other rubrics such as the American Association of Colleges and Universities (AAC&U) [VALUE rubrics](#). As an example, within *Communication*, there are dimensions for *speaking*, *writing*, *presenting*, and *listening*. The competencies and dimensions are listed below.

Table 1: Engineering Competencies and Dimensions

<p>Communication</p> <ul style="list-style-type: none"> ● Listening ● Presenting - Oral and Visual ● Speaking - Small Group or Informal Settings ● Writing
<p>Creativity</p> <ul style="list-style-type: none"> ● Applying Divergent and Convergent Thinking Processes ● Innovation ● Production of Novel Ideas ● Production of Useful Ideas
<p>Empathy</p> <ul style="list-style-type: none"> ● Cognitive Empathy ● Emotional Empathy ● Empathic Response
<p>Entrepreneurial Mindset</p> <ul style="list-style-type: none"> ● Entrepreneurial Intent ● Entrepreneurial Skills ● Intrapreneurship
<p>Ethics</p> <ul style="list-style-type: none"> ● Ethical Behavior ● Ethical Reasoning ● Knowledge of Ethics
<p>Global & Cultural Awareness</p> <ul style="list-style-type: none"> ● Cultural Competence or Awareness ● Diverse Workplace Competence or Awareness ● Global Competence or Awareness
<p>Grit / Persistence / Resilience</p> <ul style="list-style-type: none"> ● Navigating Hostile Workplace ● Overcoming Setbacks ● Perseverance for Long-Term Goals ● Pivoting when Appropriate
<p>Leadership</p> <ul style="list-style-type: none"> ● Organizational Leadership ● Societal Leadership ● Team Leadership
<p>Lifelong Learning</p> <ul style="list-style-type: none"> ● Ability to Seek out Appropriate Sources to Learn on One's Own ● Knowing when to Ask for Help ● Self-Agency in Educational Choices
<p>Risk - Ability to Accept and Manage</p> <ul style="list-style-type: none"> ● Being Proactive about Risk Associated with Engineering Work ● Consideration of Risk v. Reward in Decision Making ● Recognizing the Need to Take Risks
<p>Systems Thinking - Authentic Problem Solving</p> <ul style="list-style-type: none"> ● Ability to Break Down a System into Discrete Pieces & Put it Back Together in a Coherent Solution ● Ability to Make Appropriate Estimates when Problem Solving ● Consideration of the Multi-level Goals of the Project
<p>Teamwork</p> <ul style="list-style-type: none"> ● Ability to Work Across Disciplinary Differences ● Recognition of and Commitment to a Common Purpose/Goal ● Valuing the Development of Shared Rules, Norms, Structure

The goal of the ELF initiative is “to provide students with a framework to intentionally **explore** opportunities, **engage** meaningfully in experiences, **reflect** on what they have learned, and **communicate** the value of the core competencies they developed” [1]. The team realized that it was essential to have a tool that would prompt students to look at all of the opportunities around them - what they were already doing and what they wanted to do - and encourage them to be intentional about the activities they sought out. As important, students also needed to be prompted to stop, think, and reflect on how these experiences were helping them become the engineers they wanted to be.

The College approached the university’s Center for Academic Innovation (CAI) and learned that other academic units within the university were also interested in a competency-based student development platform. Michigan Engineering then became one of the primary partners in creating an online platform (**Spire**) that provides a mechanism for students to track and reflect on the professional competencies they are gaining through their curricular and co-curricular experiences throughout their entire time at the university. Using Kolb’s [8] cycle of experiential learning as a model, Spire allows students to choose their own pathways and experiences for active experimentation, while providing a framework for conceptualization and reflection.

Development and Implementation of Spire

CAI provides the information architecture for Spire and works with academic units to design specific features based on the unit’s requests. For example, other academic units are currently implementing Spire primarily by integrating it into the curriculum; if students earn certain grades in specific courses, they “level up” behind the scenes and students don’t necessarily interact directly with the platform. Michigan Engineering, however, wanted a different approach so students could also incorporate the skills they were gaining from co-curricular activities as well as from courses, and the CAI software developers worked to address this need.

Spire is still in development, but certain aspects have been built and implemented. All engineering students are automatically added to the platform; whether they actively participate or not is up to the individual. Students who choose to participate log in with their university credentials and answer a survey that helps personalize tips, email messages, etc. They are then provided with the list of competencies and asked to list their top three to these three questions:

- *What areas are most exciting to you personally?*
- *What areas might be most important for your career?*
- *What are your most important areas for growth?*

After those questions, students select up to three competencies to focus on (they can change these at any time if they wish). By selecting three, students can concentrate on those areas and not feel overwhelmed by all 12 competencies. Those chosen focused competencies are used on the student Dashboard to show them their development progress and in the Opportunities to highlight specific experiences that correspond to their chosen areas.

Opportunities and Reflection

In Spire, “Opportunities” are meaningful experiences during which students can practice and grow their competencies. While there are some course-related opportunities, most are experiential learning opportunities such as participation on design or competition teams, study

abroad or research abroad experiences, research projects, presenting on campus or at a conference, and so on. There are over 70 created by staff, and students are also able to add their own. So far, students have added 260 individual opportunities that only the creator can see.

Opportunities have key components such as a title and description, associated competencies, expected duration (day, semester, multi-semester, etc.), a link to additional information, and prerequisites (if applicable). Students add opportunities to their Planner with a date to complete it by, and then the opportunity displays on their Dashboard. In the future, automated email messages will use the dates set by the student to prompt them to complete the opportunity and reflect on their competency growth.

When a student completes an opportunity, they are prompted to reflect on these questions:

- *What did you do during this opportunity?* (text box)
- *Which competency dimensions did you engage with?* (see Figure 1 at right)
- *How have you grown in the dimensions associated with that competency?* (text box)

Figure 1: Competency Dimension Box

Dimension	None	Some	A lot
Listening	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Presenting - Oral and Visual	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Speaking - Small Group or Informal Settings	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Writing	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

As students complete reflections and make connections to the professional competencies required in today's workforce, they are prompted to "level up" to the next stage of the competency dimension.

Levels and Leveling Up

As mentioned above, each competency has 3-4 dimensions, and as students develop skills in a dimension of a competency, they progress through three levels. The level descriptions, reflection questions, and the learning assessment criteria are defined in the rubrics that were created for each competency such as this [Communication rubric \(https://myumi.ch/M692b\)](https://myumi.ch/M692b). A general description of each level is below:

- **Exploring** - just learning a skill (*students might engage at this level in a 100/200-level course or in the first semester of a co-curricular*)
- **Engaging** - gaining skills but not quite mastered (*students might engage at this level in a 200/300-level course or in the first year of a co-curricular*), and
- **Explaining** - mastering the skill and able to talk about it in an interview (*students might engage at this level in a 300/400-level course or in extended co-curricular participation*)

There are three ways students progress through the levels for each dimension:

- Automatically move to *Exploring* based on their reflections
- Submit a "level up" request that synthesizes their experiences and demonstrates growth (for *Engaging* and *Explaining*)
- Automatically move to *Engaging* based on course grade (piloting Winter 2024)

Students automatically progress to the *Exploring* level of a competency dimension by choosing "a lot" of engagement in that dimension when they reflect on an opportunity, or by choosing "some" engagement in the same dimension in two different opportunity reflections. As they continue to reflect on their experiences, they are prompted to submit a "level up" request to reach

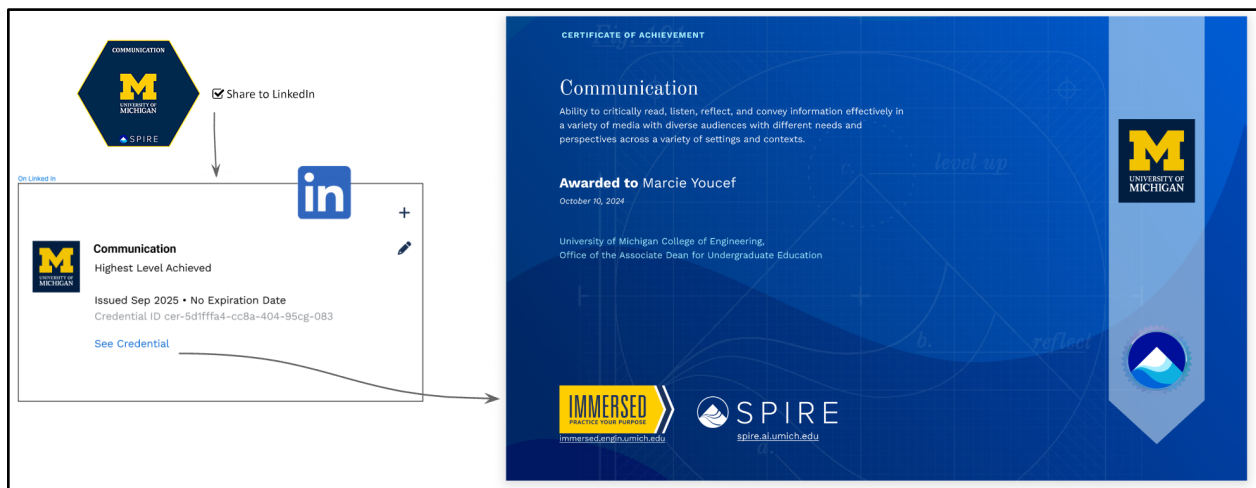
the *Engaging* and then the *Explaining* levels. In the level up reflection, students answer questions related to the competency dimension by synthesizing their experiences and demonstrating their understanding of and growth in that dimension. These level up requests are then reviewed by program staff (in the future by student workers as well) using the assessment criteria outlined in the rubric, and then the level up is either awarded or sent back to the student with a request for additional content or elaboration. The first time a student earns an *Engaging* level through this method they receive a College of Engineering t-shirt as an incentive.

In Winter 2024, we are piloting the option to automatically achieve the *Engaging* level in specific competency dimensions via final course grades that is described in more detail in the *Course Integration* section below.

LinkedIn Credential

When a student completes the *Explaining* level in at least two dimensions of the same competency - so, for example, achieves the *Explaining* level in Speaking and Presenting dimensions of the Communication competency - they earn a badge they can share to LinkedIn as a credential.

Figure 2: In Platform Badge and LinkedIn Credential



This credential works like other LinkedIn credentials; a viewer clicks on “See Credential” to see what it is for and who authorized it. Other academic units who are using Spire have a similar looking credential, thus providing a unifying indicator to employers seeking graduates of the University of Michigan. The LinkedIn credential signals the student’s development to potential employers and serves as a conversation starter in interviews and other employer interactions.

Scalability

With over 8100 undergraduates and 4000 graduate students, scalability for a tool such as this is paramount. Engineering students are automatically added to the system based on their designated college, so all they have to do is log into Spire with their university credentials - not create a separate login. As mentioned above, students can automatically move up to the *Exploring* level by completing reflections that connect opportunities to growth in specific competency dimensions. Additionally, as discussed further below, the team is piloting an option to automatically level up via final course grade.

At the same time, the team understands that one size does not fit all, and so while Spire is scalable, it is also personalized and intentional. The survey that students fill out when they first log in helps to tailor tips on their Dashboard and automatic email messages based on options they choose. Students also choose which competencies are important to *them* and that *they* want to work on. The reflections they complete demonstrate their growth in those areas and they can review them later on in their college career as they prepare for interviews and other employer interactions without additional support from Spire staff.

Course Integration

Since 2021, Spire and the competencies are introduced in a 100-level, optional engineering course that about half of the incoming students take (course enrollment is about 800 students each fall). In this course, students explore various departments and majors to learn about career possibilities as well as experiential learning opportunities within Michigan Engineering and the university at large. As part of the experiential learning section, students are introduced to the 12 engineering competencies, explore how these experiences can contribute to their professional development, and learn how they can track their progress in that development through Spire. Students choose which assignments in each course segment they want to complete - logging in, completing the survey, and selecting competencies to focus on and opportunities to pursue is one assignment choice. Since the assignment has just recently been revised, we will have assignment data from Fall 2024 and forward to use to evaluate engagement with the platform as a result of this course (this course has limited winter term enrollment).

Additionally, the adoption of Spire will be helped by integrating it into appropriate courses. For example, design courses often already have associated competencies such as communication, teamwork, systems thinking, etc. Students in these courses typically gain these skills, but the skills may not have been emphasized or had attention drawn to them. For non-design courses, if a faculty member is interested, there is likely a way to incorporate Spire; in the example special topics course mentioned below, students gain experience presenting throughout the semester.

To pilot this integration, in Winter 2024, we are working with three courses - one 200 and one 300 level Electrical Engineering design courses and a Chemical Engineering 200-level special topics course, with approximately 160 students across the three courses. The Spire team met with the instructors and determined which competency dimensions were relevant for the course and created new course-related opportunities in Spire. Early in the term, the Spire team went to each course to speak with the students about the competencies, the Spire platform, and how to use it. Students have been encouraged to contact the Spire team with any questions as well as to stop by tabling events. At the end of the term, students will automatically level up to the *Engaging* (second) level of the specific competency dimensions identified by the instructors based on their final course grades through a connection with Canvas, the learning management system. Ideally, these students will also be using Spire throughout the semester to reflect on other experiential learning opportunities they've had, such as participation on a project team or leadership in a student organization. Since the Electrical Engineering courses are sequential, the hope is that the 200-level students will be familiar with Spire when they get to the 300-level course next year and will continue to engage outside of these courses.

Student Participation

Spire is available to all engineering students, with 31% of undergraduate engineering students currently onboarded. Since the platform is fairly new, there is not a lot of data yet available, however there is some preliminary information to share. As mentioned above, when students onboard, they are asked three questions and asked to rank their top three competencies for each. Across the three academic years Spire has existed,

- for the question, “*What areas are most exciting to you personally?*” students consistently rank **Creativity, Grit** and **Systems Thinking** as the top;
- for the question, “*What areas might be most important for your career?*” students consistently rank **Communication** and **Teamwork** as the top; and
- for the question, “*What are your most important areas for growth?*” students consistently rank **Communication** and **Accepting/Managing Risk** as the top.

It’s not surprising then, that on average, **Communication, Creativity, System Thinking, Grit** and **Teamwork** are the top competencies students choose to focus on, and students choose their activities accordingly. Sixty percent of onboarded students have planned at least one opportunity and 95% of those students have chosen at least one opportunity that includes a competency they are focusing on. Since many of these are planned in the future, just 5% of these have completed the activity and reflected so far, but we expect that number to grow significantly in the future.

Currently, as mentioned, students can earn t-shirts for first time level up submissions and digital credentials to share on LinkedIn upon completion of a required number of reflections. The team is also looking at other incentives to encourage participation as well as ways to keep students engaged with the platform when it is not directly related to a course, since one of the primary goals is to encourage reflection on skills gained in co-curricular activities. This includes outreach to student organizations and collaboration with experiential programs such as study abroad and the summer undergraduate research program to build awareness of the value of Spire as a repository and tracking mechanism for personal professional development. Ideally Spire will become ingrained in the college culture as a way of reflecting on and building professional competencies and will be referenced by all experiential learning units as the tool to do that.

Next Steps

At the end of the semester, the Spire team will analyze the participation of all students, including the students in pilot courses. For students in the pilot, we will be looking for engagement outside of the automatic level up and compare that result to students not in the pilot. The Electrical Engineering design courses integration with Spire can be a model for design courses in other disciplines, and we are hopeful that other faculty members will be interested. This integration does not require any change to the course content and is of minimal effort for the faculty member - a meeting before the semester starts to determine which competency dimensions fits the course and creating a 15 minute space in one class meeting for the Spire team to make a presentation.

Conversations with instructors in the courses required for study abroad students as well as Honors instructors are currently underway, and we hope to have something ready for fall. There is a 400-level course that is a “bookend” to the 100-level course mentioned above, and as more students reflect and use Spire, students who take the 400-level course can use the reflections and synthesis they have done in Spire to enhance the stories they will develop in that course.

The Michigan Engineering Spire team continues to collaborate with the Center for Academic Innovation in the development and iteration of Spire. For example, we have suggested changes to the student Dashboard, reflection and level up screens and have requested increased analytics that program staff can access directly. We also continue to work with the other academic units that are implementing Spire so that we may learn from their implementation and make sure we are all moving forward together.

Conclusion

Though the adoption of Spire is in early stages, this semester brings new course integrations and a building awareness of the value of this platform. In the coming months, the team will be evaluating the pilot projects as well as general participation in Spire. This information will be used to guide future faculty discussions on incorporating Spire into classes as well as the ongoing conversations with the experiential learning programs' leadership. As students move through courses that integrate Spire, ideally, they will see it as a tool to help them form their personal narratives as they prepare for interviews and careers after graduation, and as general engagement grows, students will gain self-awareness of their professional skills and be able to better communicate them to employers.

References

- [1] J. H. Callewaert, J. M. Millunchick, C. S. E. Woodcock, K. C. Jiang, and S. Edington, "Developing a Framework for Experiential Learning," presented at the 2020 ASEE Virtual Annual Conference Content Access, Jun. 2020. Accessed: Jan. 16, 2024. [Online]. Available: <https://peer.asee.org/developing-a-framework-for-experiential-learning>
- [2] J. H. Callewaert, J. M. Millunchick, C. S. E. Jamison, and K. C. Jiang, "Assessing and Communicating Professional Competency Development Through Experiential Learning," in *2021 ASEE Virtual Annual Conference Content Access*, 2021. Accessed: Jan. 16, 2024. [Online]. Available: <https://peer.asee.org/assessing-and-communicating-professional-competency-development-through-experiential-learning>
- [3] J. H. Callewaert and C. S. E. Jamison, "Supporting the Development of Professional Competencies and Engineering Identity at Scale," presented at the 2023 ASEE Annual Conference & Exposition, Jun. 2023. Accessed: Jan. 16, 2024. [Online]. Available: <https://peer.asee.org/supporting-the-development-of-professional-competencies-and-engineering-identity-at-scale>
- [4] National Association of Colleges and Employers, "NACE Job Outlook 2024," National Association of Colleges and Employers, 2023. [Online]. Available: naceweb.org
- [5] C. Stewart, A. Wall, and S. Marciniac, "Mixed Signals: Do College Graduates Have the Soft Skills That Employers Want?," *Compet. Forum*, vol. 14, pp. 276–281, Jan. 2016.
- [6] S. Eisner, "Grave New World? Workplace Skills for Today's College Graduates," *Am. J. Bus. Educ.*, vol. 3, no. 9, pp. 27–50, 2010.
- [7] C. S. E. Woodcock, J. Callewaert, and J. Millunchick, "Synthesizing definitions of professional competencies linked to experiential learning in engineering education: a literature review," *J. High. Educ. Theory Pract.*, vol. 21, no. 4, pp. 123–146, 2021.
- [8] D. Kolb, *Experiential Learning: Experience as the source of Learning and Development Second Edition*. 2015.