

Faculty Development Plan

Department of Civil and Construction Engineering
Brigham Young University

The following faculty development plan includes my goals, achievements, and self-assessment with regards to teaching, research, and citizenship. It highlights where I am, where I would like to be going, and how I plan to achieve these goals. For clarity, teaching, research, and citizenship are presented separately.

I. Teaching

I.A. Self-Assessment

While I have worked as a teaching assistant for a number of classes in various capacities, this is my first time being responsible for the entire teaching experience in a college setting. Serving as a missionary for the Church of Jesus Christ of Latter-day Saints helped me understand general principles for teaching new material, but I have had little experience teaching engineering apart from my first year at BYU. Though my first semester was a bit bumpy, the second seemed run much more smoothly. Nonetheless, I understand that I have room for improvement in creating meaningful learning experiences, assessing student success, and modifying teaching based on student feedback.

I.B. Professional Goals

To increase my efficacy as a teacher, I intend to focus on the following goals:

1. Connect with students personally by knowing student names early in the semester,
2. Incorporate meaningful projects into course curricula by the end of my third year,
3. Discover intelligent and sustainable methods for formative and summative assessment by the end of my third year,
4. Develop two new graduate classes exciting civil engineers about structural mechanics by Winter 2024, and

I.C. Relationship Between Personal and University Goals

The aforementioned goals support department and university goals in the following manner:

1. A BYU education is spiritually strengthening and character building. These aims are best achieved when teachers and mentors model the behavior of a disciple of Jesus, including charity and sincere interest in students. One simple way to show this and begin a meaningful relationship is to know student names.

2. A BYU education is also intellectually enlarging and leads to life-long learning. Studies show that engineers often connect most with their classes when realistic projects are integrated into curricula.
3. Meaningful, personal, and sustainable efforts to assess students improves their retention of information while also allowing me, as their teacher, to focus on other responsibilities, including building student relationships, time in office hours, improving pedagogy, research, and citizenship.
4. The civil engineering department strives to create "world-class civil engineer[s]." Structural mechanics and computational engineering has revolutionized the way engineers now work, and generating enthusiasm for and interest in structural mechanics will help them know how to create and apply new tools to facilitate better engineering.

I.D. Resources Needed

I already have access to a number of resources necessary to complete these tasks, including BYU's learning management system, a well-kept library system, and computational resources provided through the CAEDM branch of the College of Engineering. I also have access to a number of educational resources through the library's catalog and through the Center for Teaching and Learning. At this point, the resource I need most to accomplish these goals is time. Teaching assistants would also be valuable, but our department is having a particularly challenging time hiring student TAs for mentoring and grading when they can get an internship that pays more and may lead to a post-graduation career.

I.E. Activities Thus Far

1. I have successfully learned all student names within the first two weeks of classes each semester.
2. I created a set of five projects incorporating the material learned in CE 321 with the analysis of a toy commercial structure. I am in the process of creating a project for my graduate class this upcoming semester.
3. I have created the first-iteration of a personalized computer-based grading system for each of the five above-mentioned projects. While coding these took some time, I expect them to reduce my grading load by over 40 hours per semester while still giving meaningful and personalized feedback to students.
4. These are being developed, and their first iterations will be in the upcoming school year.

II. Research

II.A. Self-Assessment

Having been hired immediately after my PhD, I am still working to develop my research name and agenda. However, I believe that I am working on a number of compelling subjects: there

are a number of people from industry that are very interested in my computational mechanics work, and the NSF has funded a number of projects related to my area of research in recent years. I anticipate that my experience, combined with interests from industry and funding organizations, will lead to a successful research program.

II.B. Professional Goals

I plan on developing a research program that better integrates engineering analysis with other aspects of computer-aided engineering, such as engineering design. My current emphasis is in converting a CAD model into an analysis-suitable representation through a process called “meshing,” though I am also working on creating better techniques for engineering analysis using finite element (or more particularly, isogeometric) techniques. To facilitate this research, I will focus on the following goals:

1. Submit at least two external funding proposals for over \$100K annually; one if already well-funded,
2. Apply for an NSF CAREER Award during my third, fourth, and fifth year while at BYU,
3. Recruit 1 PhD student prior to December 2023 and another prior to December 2026,
4. Publish two journal articles with a student co-author prior to my sixth year at BYU,
5. Submit at least three publications annually, two of which will be to top-tier peer-reviewed journals, and
6. Engage with department faculty—particularly those in structural engineering and construction—to find areas of mutual interest for collaboration by the end of my fourth year; apply for a collaborative grant by this time.

II.C. Relationship Between Personal and University Goals

The above goals aim to create a world-class, externally-funded research program. The first two goals will help establish credibility of and funding for my research program. My goals regarding PhD students and student publication aim to help create world-class civil engineers that can be hired at top jobs in computational mechanics while also fulfilling BYU’s drive to mentor students. Submitting publications will help the name of BYU, and working with collaborators in the department will help bring more unity in the department and a better vision of the needs of civil and construction engineers.

II.D. Resources Needed

My research agenda really requires an ability to find and recruit top students for a doctorate degree. Funding is absolutely critical here, which is why I have a high emphasis on securing long-term external funding. I appreciate BYU’s Offices of Research Administration and Research Development in working to secure and use this funding. For many of these projects,

I need to find a collaborator—preferably at BYU—that can help with work. Additionally, I would appreciate a better understanding of current needs of BYU undergraduate and graduate students, as well as outreach programs, so that I can craft more meaningful proposals with more compelling impacts on students and the community at large.

Apart from this, I need resources to purchase hardware and software necessary for my research. My startup package is sufficient for these needs. I also need enough time to study the literature, develop new ideas, and propose and publish research.

II.E. Accomplishments

Since joining BYU, I have published two peer-reviewed articles and two conference papers; I have also submitted one more for publication and am finalizing two more. I have also applied for two NSF grants. Though neither of these was funded, the feedback that I received on one is being used to create a stronger proposal with additional broader impacts, and I am working with a professor of user-experience at the Y to improve the other. I will be resubmitting the proposals later this year.

While I have not yet recruited a PhD student, I am working with two undergraduates to develop a mentored research grant idea that will result in a publication. I will begin recruiting a PhD student as soon as I secure additional funding.

III. Citizenship

III.A. Self-Assessment

As before, I am still navigating the newness of the professorial experience; citizenship is something that I have not explored much. I am involved in four professional societies, however, and I am also connected to the isogeometric analysis and meshing communities, so I plan on leveraging these connections to do more.

III.B. Professional Goals

During my first six years at BYU, I plan to

- External
 - Serve on a National Science Foundation review committee by August 2026;
 - Regularly review papers from two top journals (graphics and engineering);
 - Help coordinate a mini-symposium for an international conference by December 2025;
 - Serve on the editorial board of an academic journal by the end of my 6th academic year;
- Internal
 - Continue serving on the department structures committee and undergraduate committee;

- Better connect the applied math department with the engineering department;
- Help with the department FE review course yearly;
- Serve on committees of master’s and PhD students;
- Help mentor at least two undergraduate students annually.

III.C. Relationship Between Personal and University Goals

The proposed external citizenship goals will help develop the role of BYU ’s Civil and Construction Engineering Department as an important player in computational mechanics. Additionally, serving as a panelist on an NSF review board will give me a better feel for how to create a better NSF proposal, and both helping coordinate a mini-symposium and working as a journal editor will be valuable for establishing new research collaborations. The proposed internal citizenship goals will make sure that structural analysis and mechanics are well-represented in the undergraduate and graduate curricula. They will also help connect students and research between different parts of the university.

III.D. Resources Needed

For these resources, I will mainly need to work with my department chair to ensure that my departure to help on an NSF review panel does not interfere with other responsibilities that need to be accomplished while I am gone.

III.E. Activities Thus Far

I have already reviewed several papers from two top journals—*Computer Methods in Applied Mechanics and Engineering* and *Computer Aided Design*—since being hired at BYU. I have also had a number of conversations with Emily Evans, from the Applied Math Department, about courses that ACME students can take to graduate with a structural mechanics emphasis. Finally, I am actively working with several undergraduate research assistants.