SAMPLE 1

Faculty Development Plan

Associate Teaching Professor
Chemical Engineering Department, Brigham Young University
February 9, 2024

Summary
My purpose in being an associate teaching professor at Brigham Young University is to advance the mission of BYU and to help others including myself fulfill its aims. I'm excited to bear witness of the truths of the Gospel of Jesus Christ in how I think, speak, act, and teach. I hope to emulate the Savior Jesus Christ in continually learning from the spirit, from my colleagues, from students, and from the professional community. I also hope to teach in the Saviour's way in (1) loving those I teach, (2) teaching by the Spirit, (3) Teaching principles, (4) demonstrating principles and (5) inviting diligent learning. My primary focus as a professional faculty (versus professorial) is teaching engineering principles effectively and in managing the undergraduate laboratories for Chemical Engineering. The three areas of focus for evaluating my performance are Teaching, Professional Service (Laboratory Management), and Citizenship.

BYU College of Engineering Chemical Engineering

1. Teaching and Mentoring

I quit my job as an engineering consultant in the defense industry to have the opportunity to teach the gospel of Jesus Christ together with engineering principles to men and women at Brigham Young University. I am passionate about the importance of making and keeping covenants as instituted by God and directed by His prophets. I'm also passionate about helping others learn and then make accurate engineering predictions with data analysis to serve others directly and indirectly in their future work place.

1.1 Where I Stand

I team taught several chemical engineering lab classes in my first Fall semester and then taught ChEn 479 (UO Lab) in the Winter of 2023. I was able to share my testimony in multiple ways and I also created and shared multiple (>12) engineering demos in addition to the detailed laboratory class exercises. I tried to bring in the experiences I have had in industry as an engineering consultant for the previous 15 years. I also presented material to hopefully strengthen the students spiritual health. I received high student ratings >4.5 for that first class I taught. I have other teaching and mentoring experiences to draw from including coaching competitive soccer, coaching CrossFit, and mentoring young men as a youth leader in the Church of Jesus Christ of Latter-day Saints.

In the Fall semester of 2023, I taught ChEn 263 and ChEn 345. I developed new content for both courses with content for 263 outlined on a JupyterBook website: https://clint-bg.github.io/comptools/intro.html. For ChEn 345, new lab activities for the reactor cart were introduced and received well. I received feedback and a general rating of 4.2 for 263.

I look forward to learning how to teach better as I continue. Below are some short-term and intermediate goals.

1.2 Short-term Plans and Goals

Short-term here are the goals that have already been completed since drafting this document and those I want to complete before the end of Winter 2024 semester.

- Attend the university teaching training offered in the spring and fall seminars for new faculty (completed)
- Update the UO Lab and Fundamentals Lab websites (completed)
- Successfully teach my first class (completed Winter 2023 ChEn 479)
- Develop improved content for the UO Lab (completed and ongoing)
- Develop improved content for the ChEn 285 Lab (completed and ongoing)
- Develop improved content for the ChEn 345 Lab (completed and ongoing)
- Develop course content for ChEn 263 that includes my experiences and expertise (completed: ChEN263 class link)

- Develop course content for ChEn 311 that includes my experiences and expertise (ongoing)
- Seek for and accept feedback from colleagues and students for the ChEn 263 course (completed and ongoing)
- Begin releasing content on the web for laboratory demonstrations that include modeling calculations and reinforcing content for the UO and Fundamentals labs (started and ongoing: tipice.byu.edu and github link).
- Mentor multiple students
  - TIPICE lab assistants: Nathan Gartner, Gregory Lakis, Nathaniel Adams, and Jacob Burrell
  - Experiential Learning student with ASEE publication on terrarium kinetics laboratory activity: Joseph Tuft
  - UO Lab student I tutored for the FE exam: Tanner Garrett

1.3 Intermediate Plans and Goals

The below items are intended to be completed in the first 3 years I am at BYU.

- Improve the course content for the courses I will be teaching by incorporating student and reviewer feedback
- Coordinate updated UO Lab and Fundamentals lab activities with the other instructors in the department to ensure consistency of vision and implementation
- Submit an NSF Proposal for educational research like for the PFE-RIEF program.
- Publish a paper at the ASEE conference on engineering education together with a collegue and undergraduate

2. Professional Service: Undergraduate Laboratory Management

I was hired in July of 2022 with the directive (in addition to teaching 7-12 credits in the Fall and Winter and one course during the Spring or Summer terms) to "direct the teaching labs in Chemical Engineering which includes leading the teaching, training, management, safety, and future direction of the teaching labs." I'm so grateful for the opportunity to help students gain hands-on experience working with chemicals and equipment and data acquisition hardware and software. That portion of the position is critical to me.

2.1 Where I Stand

I have worked with the Chemical Engineering department leadership to establish the Theory Into Practice in Chemical Engineering (TIPICE) group to collaborate with the department, Rubin McDougal (the laboratory manager), and our team of undergraduate students. The group is focused on theoretically based laboratory experiences in chemical engineering. Further info is at the updated website for the teaching labs at tipice.byu.edu. We have been working hard to improve upon the laboratory and laboratory activities as detailed here: Notion team collaboration site.

2.2 Short-term Plans and Goals

The below plans have been or will be completed by the end of the Winter 2024 semester. These and others are outlined at our Notion team collaboration site under the 'Improvements Made' and 'Current Efforts' pages.

- Complete a proposed undergraduate laboratory philosophy (completed, see here)
- Add a Job Hazard Analysis template to the UO Laboratory website to facilitate safety analysis (completed)
- Improve the Labview data collection and programming exercise as part of the UO lab (completed by adding a finned exchanger with heater and water cycle loop)
- Add additional problem statements for the Problem Based Learning (PBL) portion of the UO lab (completed with adding a heater with a relay and a filter based problem statement).
- Install, test, and set problem statements for disolved oxygen in 3 bio-reactors for use in the UO lab.
- Setup yogurt optimization problem for UO lab and implement it (completed and used Winter 2024).
- Integrate the newly purchased analytical tools (Karl Fischer titrator and densitometer) into the ChEn 445 fundamentals class.
- Other items detailed at the Notion website.

2.3 Intermediate Plans and Goals

- Release TIPICE Newsletters frequently to keep the department abreast of our activities
- Develop a desktop chemical engineering lab that's similar to a robotics control and measurement device that includes machine learning and multiple attachments (see for example, University of Tennessee EF 230 Sphero RVR Robot Course)
- Complete experimental design and use statements for students to use a dialyzer for mass transfer experimentation
- Complete experimental design and use statements for students to complete Ecoli experimentation with the bioreactors
- Complete setup of the two new GC's obtained for the UO lab
- Other items detailed at the Notion website.

2.4 Experiential Learning Efforts

In additional to the efforts outlined above for undergraduate laboratory activities, I have goals for helping students with experiential learning including:

- Write a journal article detailing modeling and data collection for HD1.3 recommended separation distances (completed as documented here).
- Complete a proposal to help with funding student research (completed in collaboration with Safety Management Services, Inc. and the Department of Defense Explosive Safety Board, $200,000).

- Use experiential learning funds to begin research using the closed-cup flash point tester (on loan from Dr. Vince Wilding) as well as manufacturing a vapor pressure measurement device to explore and document the effects of cabosil mixtures with oxidizing liquids used with polymerization initiation on flash point depression.
- Collaborate with a student to complete the research begun at Safety Management Services, Inc. to create a tool to estimate overpressures from HD1.3 events (Bubble Dynamics).
- Publish a paper with ASEE Conference proceedings and present at the meeting with an undergraduate researcher on the terrarium kinetics fundamental lab setup (paper submitted).

3. Citizenship

Brigham Young University embodies service to each other. Serving in the department, college, university, and community at large is critical to be a successful part of BYU.

3.1 Where I Stand

I am dedicated to helping the department, college, and university be successful in serving others in the community. I have been active as a member of the Undergraduate Committee in the Chemical Engineering department and have visited other departments at BYU (physics, chemistry, and life science) and other universities (University of Utah and University of Tennessee) to collaborate with other engineering education professionals. I also get to help with safety at the Chemical Engineering department level and have enjoyed working with the Graduate Student Safety Council, the department chair, and the College of Engineering safety officer. I've also enjoyed working with the ChemE car club and look forward to doing it again.

3.2 Short-term Plans and Goals

- Identify and join a professional society: ASEE-American Society for Engineering Education (completed)
- Reach out and meet with others in my position at BYU and other universities to learn how they have been successful. Meet with Tony Butterfield (Univ. of Utah Engineering), Nathan Powers (BYU Physics Lab Director), Matt Arrington (BYU Greenhouse), Rebecca Sansom and other teaching professionals (partially completed).
- Continue serving as the Department Safety Officer and meeting with the Graduate Student Safety Committee with Brayton Young as the leader of that committee.
- Work with Brayton to finalize the safety reviews to give an award to the lab with the most points
- Present at the graduate seminar as part of the Engineering Safety week and facilitate safer operations in each lab in the chemical engineering department.

3.3 Intermediate Plans and Goals

- Collaboratively complete safety and operations review of the department research labs
- Have a leadership position in a national organization
- Attend and contribute to an engineering education conference (partially completed as I recently attended the FYEE-ASEE conference and reported on what other universities are doing in the first year of their programs to the Undergraduate committee in the department)
- Continue to serve on the Undergraduate Committee of the department
- Continue to be involved in the College Safety Conference

Goals for Second Semester Teaching of ChEn 263

As part of the NFS (New Faculty Seminar) Final Checklist, this document details the goals of teaching my second semester of ChEn 263: Computational Tools for Chemical Engineers.

I taught the course for the first time in Fall of 2023. I'll teach it again either this spring or next fall. I'm excited to teach it again and have a few goals to improve the course:

- Change the beginning of the course to first introduce Excel and some of the basics of programming with VBA (Visual Basic for Applications). This will help students understand the basics of programming and how to use Excel to solve problems.
- Improve the end of term projects such that the problem statements are clearer and the students have a better understanding of what they need to do.
- Incorporate more flipped classroom techniques and active learning in the course. I'd like to record at least a quarter of the lectures and make them available.
- Incorporate daily quizzes to held students accountable for completing activities to prepare for classes that day.

Professional Faculty Development Projects

I have worked with the Chemical Engineering department leadership to establish the Theory Into Practice in Chemical Engineering (TIPICE) group to collaborate with the department, Rubin McDougal (the laboratory manager), and our team of undergraduate students. The group is focused on theoretically based laboratory experiences in chemical engineering. Further info is at the updated website for the teaching labs at tipice.byu.edu. We have been working hard to improve upon the laboratory and laboratory activities as detailed at a Notion team collaboration site.

Short-term Plans and Goals

The below plans have been or will be completed by the end of the Fall 2023 semester. These and others are outlined at our Notion team collaboration site under the 'Improvements Made' and 'Current Efforts' pages.

- Complete a proposed undergraduate laboratory philosophy draft here
- Add a Job Hazard Analysis template to the UO Laboratory website to facilitate safety analysis (completed)
- Add additional problem statements for the Problem Based Learning (PBL) portion of the UO lab (completed with adding a heater with a relay and a filter based problem statement).
- Install, test, and set problem statements for dissolved oxygen in 3 bio-reactors for use in the UO lab.
- Integrate the newly purchased analytical tools (Karl Fischer titrator and densitometer) into the ChEn 445 fundamentals class.

Intermediate Plans and Goals

- Release TIPICE Newsletters frequently to keep the department abreast of our activities
- Develop a desktop chemical engineering lab that's similar to a robotics control and measurement device that includes machine learning and multiple attachments see for example the documentation here on the University of Tennessee EF 230 Sphero RVR
- Complete experimental design and use statements for students to use a dialyzer for mass transfer experimentation
- Complete experimental design and use statements for students to complete Ecoli experimentation with the bioreactors
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Experiential Learning Efforts

In additional to the efforts outlined above for undergraduate laboratory activities, I have goals for helping students with experiential learning including:

- Write a journal article detailing modeling and data collection for HD1.3 recommended separation distances (completed as documented here)
- Complete a proposal to help with funding student research (completed in collaboration with Safety Management Services, Inc. and the Department of Defense Explosive Safety Board, $200,000).
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and document the effects of cabosil mixtures with oxidizing liquids used with polymerization initiation on flash point depression.
- Collaborate with a student to complete the research begun at Safety Management Services, Inc. to create a tool to estimate overpressures from HD1.3 events (Bubble Dynamics).

Citizenship Development Goals

I am dedicated to helping the department, college, and university be successful in serving others in the community. I have been active as a member of the Undergraduate Committee in the Chemical Engineering department and have visited other departments at BYU (physics, chemistry, and life science) and other universities (University of Utah and University of Tennessee) to collaborate with other engineering education professionals. I also get to help with safety at the Chemical Engineering department level and have enjoyed working with the Graduate Student Safety Council, the department chair, and the College of Engineering safety officer. I've also enjoyed working with the ChemE car club and look forward to doing it again.

Short-term Plans and Goals

- Identify and join a professional society and eventually attain a leadership position: ASEE-American Society for Engineering Education (completed)
- Reach out and meet with others in my position at BYU and other universities to learn how they have been successful. Meet with Tony Butterfield (Univ. of Utah Engineering), Nathan Powers (BYU Physics Lab Director), Matt Arrington (BYU Greenhouse), Rebecca Sansom and other teaching professionals (partially completed).
- Continue serving as the Department Safety Officer and meeting with the Graduate Student Safety Committee with Brayton Young as the leader of that committee.
- Work with Brayton to finalize the safety reviews to give an award to the lab with the most points as part of the Graduate Student Safety Committee.

Intermediate Plans and Goals

- Collaboratively complete safety and operations review of the department research labs
- Have a leadership position in a national organization
- Attend and contribute to an engineering education conference and serve in a leadership position (partially completed as I recently attended the FYEE-ASEE conference and reported on what other universities are doing in the first year of their programs to the Undergraduate committee in the department)
- Continue to serve on the Undergraduate Committee of the department
- Continue to be involved in the College Safety Conference

Teaching Grant Request

I am requesting a 500 dollar teaching grant to integrate an improved final project or case study into the ChEn 263: Computation Tools for Chemical Engineers.

In the Fall of 2023, I taught the course for the first time. The case studies were a significant part of the course. Each of the 3-person teams could choose one of the options to complete a final project integrating their coding skills. I developed each of the options that integrated both coding and hardware activities to solve one of three problems as outlined here: case study options.

With the 500 dollars from the grant, I would be able to acquire additional hardware to add more options for the case studies. The specific hardware to be purchased would likely be Rasperry Pi's with low-cost sensors and actuators to potentially both acquire data and control a simple process.

The students would have more options to gain experience with utilizing controllers and active coding to solve problems such as temperature control, level control, or flow control.