Faculty Development Plan

Name, Assistant Professor
Chemical Engineering
Department Brigham Young
University

By going through the job interview at BYU for my current position, my first semester, and the series of FDS seminars, I realized BYU was an extension of the Church, not a typical religiously affiliated university, which adds a bit of religious principles to its regular curricula. BYU promotes spirituality and good citizenship by rearing new generations of scholar-disciples willing to assume responsibilities, follow the teachings of Jesus Christ, and attend to the needs of their respective communities and professional responsibilities. Acknowledging I am the one who have to teach these new generations, I lay out my goals as a chemical engineering professor in three folds, namely teaching, scholarship, and citizenship. This plan mostly explains my short-term goals (1 – 3 years), frequently mentioning mid-term goals (4 – 7 years) and long-term goals (8+ years).

TEACHING

I want to be a respected and respecting mentor who teaches principles clearly at the level of students' understanding to enlarge and deepen their knowledge. Most of all, I want to be an example of a scholar-disciple by word and deed, openly expressing my religious point of view while relating the knowledge and principles of chemical engineering to the gospel. In every class, I will explain learning specific engineering disciplines can be important in fulfilling their duties as children, parents, bishops, relief society president as well as process engineers, quality engineer, consultants, and many of their potential professions.

Where I Stand

Though I knew that I am not an excellent teacher, I thought I was at least an okay teacher. I knew that I understood the materials and thought that mattered the most. However, I found out that was not the case. I taught a class (CH EN 273) for Winter 2018 and received feedback from the students from the class. Though they thought I knew the material and the class was well organized, they had a hard time grasping the concepts and had issues with how they were evaluated. They felt that I was respectful of them and willing to have time with them. With these comments in mind, I set the goals for the next several years. I am assigned to teach CH EN 433 Energy Engineering during Fall 2018, and CH EN 273 again for Winter 2019. These assignments are likely to last until my third-year review.

Short-term Goals/Plans

1. Learn the materials

   I will first learn the materials inside and out. CH EN 433 is not a typical chemical engineering course which usually has well-defined course materials and concepts to teach. Though young at teaching, I have given a lot of freedom in preparing the course whatever way I like. To fulfil my aforementioned goals as a teacher, I have to invest a lot of time and effort. In the next few months, I will prepare the course material carefully by choosing appropriate textbooks as well as updating the energy trend information with the most up-to-date data. Therefore, I will read from various sources and literature.

2. Practice delivering concepts

   One of the major reasons for low student ratings from the CH EN 273 Winter 2018 class was my lack of clarity in explaining concepts or procedures for approaching problems. Therefore, I will improve on explaining them for both CH EN 433 and CH EN 273. Fortunately, there are many YouTube videos regarding such materials made by professors inside and outside of BYU. As a result, I expect to receive a higher rating for "Explained concepts effectively" item of the student rating at the end of the semester. Again, CH EN 433 is not a traditional course and terms used in the course materials. Especially for this course, I will learn to use layman's terms. I will verbally practice delivering concepts before each class at least a day before each class.

3. Integrating the Gospel into classes

   One thing I neglected during my first semester was that I cared less about discussing spiritual matters. I will point out to students that their secular education and knowledge are closely related to their religious life. I will discuss (1) why receiving education is important and their purposes, (2) why becoming a responsible and honest engineer is more important than being the smartest engineer, and (3) what we can do to be light to the engineering society. My personal spiritual progress is evidently very important in affecting students for their growth. I will study scriptures and general conference talks daily to receive power to influence students.

4. Receive evaluations/feedbacks

   I will seek for feedbacks from at least one senior professor (most likely my faculty mentor Dr. John Harb) and one junior professor. I will ask each professor to attend my class at least once during my class. Dr. John Harb provided me with his reviews twice during Winter 2018. He will be able to tell if I have improved at all. A junior faculty member will be able to see what new things I can do compared to his/her classes. I will also ask SCOT to record my class and give me feedbacks. A mid-course evaluation will be performed as well. After

gathering feedback, I will set at least three specific aspects to improve based on the feedback. The student rating at the end of each semester will be scrutinized to see if I actually carried out the plan and the performed changes are effective.

Mid- and Long-term Goals/Plans

Here, I present the plans/actions I want to achieve in 3+ years. During my first three years, I will review my short-term goals, ponder these long-term goals, set new goals, and think about the way to achieve these goals. To achieve these goals, I will read books regarding pedagogy and improving teacher quality, keep attending Teaching and Learning Seminar series offered by the College of Engineering, and other relevant seminars from the university.

1. Receive a student rating up to 4.5 by the end of Fall 2020

   I have a good idea about how to receive the rating up to 4.2 judging by my performance during Winter 2018. This can be done by carefully following the short-term goals and focusing more on evaluation itself. However, I am not sure how other professors in my department do so well in teaching and interacting with students, shown not only by their student ratings, but also with their students' respect to them. My approach will be benchmarking their classes and getting feedback from them. I will not be shy about getting help and monitoring how they teach their classes.

2. Develop more action-based classes

   The best way to learn is to teach. I will have students present each class (for 3 – 4 minutes) as many instructors do, to increase their interest to the topics. Their presentation will be evaluated by peer and they will be rewarded with small gifts funded with the Teaching Development allowance. As I teach the same topics again (CH EN 273 and 433), I will add at least one thought-provoking question to each class every time I prepare for the class materials each semester.

3. Develop Colloid and Surface Science class

   Though my research specialty, colloids and surface science, is used in many different physical science disciplines, there is no one teaching the subject at BYU. Over the next two years, I will carefully select the topics that are needed most for the graduate students across BYU, and develop the course. The developed syllabus and materials will be presented to the professors whose graduate students might be benefit most from it and receive their feedbacks.

SCHOLARSHIP

I enjoy doing research and am proud to be an experimentalist. I like to talk to people about my research and hear theirs. While I plan to keep enjoying what I do as a researcher, I also want to fulfill BYU's mission by nourishing and raising future generations of disciples who know the principles and application of chemical engineering toward their vocations and services to others. It will be my delight to see the students who will work with me graduate from BYU not only with great scholarly success but also with a determination to contribute to their family, fellows and communities. To help myself plan to be such a scholar, mentor, and researcher, I describe the following plan. The specific field of study and goals to be completed by February 2019 are described in the Scholarship Strategies Project.

Where I stand

I have accomplished much through my master's, Ph. D., and postdoctoral research projects. I learned a lot from my advisors not only as a researcher also as a friend. I especially appreciate my Ph.D. advisor, Dr. William Ducker, who treated me as his colleague and friend. Due to him, I have a good role model. I do not have as many publications as other assistant professors in chemical engineering do, but the depth and breadth of my work qualify me to tackle broader and difficult subjects. However, I still have more to learn. I do not have a habit of continual reading or writing, as many successful researchers at academia do. Though I like to talk about research, I am not good at approaching people because I think I may waste their time. I will learn to make friends and find collaborators.

Short-term Goals/Plans

1. Build a habit of reading

   Compared to other assistant professors, the time and effort I allocate for reading are less than average. I tend to read when it is necessary or a situation requires, in such cases as writing grant proposals, planning for experiments, and writing papers. Accumulating top-notch and up-to-date research materials, not for doing what have to be done in short time, but for constant nourishment as a researcher, is needed for me because knowing what have been or have not been done is an absolute necessity for defining research topics. In addition, I can build on their knowledge to pursue the answers for my own research quest.

   I hold a weekly meeting with my graduate student, Hans Larsen. He is my only graduate student for now. I plan to recruit one more graduate student along with one undergraduate student per each graduate student. During our weekly meeting, I will present the summary of one paper followed by one of my students presenting the summary of one paper each week.

2. Build a habit of writing

   Since the success ratio of funded projects to proposals is around 1:3, I should keep looking for new ideas by constantly reading. Since I claim I am the one who organize thoughts (creating new ones and discarding unimportant or incorrect ones) while talking or writing, I will build a habit of writing proposals based on the principles and structure I learned from Grant Proposal Writing Bootcamp (May 14 – 17th, 2018 prepared by Faculty Center). I will dedicate at least 30 minutes each day in preparing details as well as outlines. The time for building a habit of reading and writing will be at least 45 minutes. This will be done between 9 to 10 am each morning when there is no class or meeting. It will be between 11 am to 12 pm when there is a conflict of schedule. From constant reading and writing, I will prepare at least six white papers per year and send them out to appropriate program managers.

3. Finding collaborators

   I will find and email one person every month within BYU to set up a meeting to discuss possible collaborations. I will not limit my search within the ones that would help my current projects. My search will be based mainly on my reading and white papers. I will participate the network events prepared by the Faculty Center to widen my views.

4. Writing three proposals per year / maintaining the funding around 250,000 USD/year

   From reading, writing, and talking to possible collaborators, I will write at least three proposals each year to maintain three graduate students and up to six undergraduate students. Without purchasing expensive capital equipment, the research activities for one graduate student costs around 80,000 USD/year. With the success rate of 1:3, I will write at least three proposals to maintain 250,000 USD/year until the 6th year.

<u>Mid- and Long-term Goals/Plans</u>

1. Become an expert in wetting phenomena

   I plan on continuing my research in wetting phenomena to study systems with more than two liquid species with rough and flexible solids. This research is to understand more complex and practical applications. I admire other researchers who have been in this field for a long time and written papers which had profound impacts in this field. While I will definitely widen my research field, I will be holding on to wetting phenomena in completing

research done by the ones I admire, hoping that one day researchers after me appreciate my predecessors' research along with mine.

2. Expand research areas into bio-adhesion and astrobiology

   As a part of widening my research area, I will study biology and bioengineering applications with which I am not well versed. My ultimate goal in studying bioengineering is developing a universal adhesive which works inside various organs in human bodies, i.e., gum to teeth, cell to cell, bone to muscle. This will be a stepping stone for studying astrobiology in investigating cell or virus viability in extreme conditions and in space. This will help assess the effect of populating earth-originated organisms in Mars or other planets and moons, either intentionally or by mistake.

3. Build collaboration networks

   Many agree that collaboration is the key to success. I will attend 1.5 conferences per year to present my research and find researchers who might be interested in collaboration. I will build professional and personal relationships with them. I am especially interested in getting connected with local researchers such from University of Utah or USU. I will find researchers who may be benefit from my expertise.

CITIZENSHIP

My short- or mid-term goals are to proactively participate in the department committee I am currently assigned to and look for other temporary services within the department. Standing committee assignments are given from the department, over which I do not have control. However, when needs arise to change courses, organize temporary committees for other affairs, and so forth, I will volunteer to serve in those committees.

Where I stand

I am currently in the undergraduate committee for the Chemical Engineering Department and has served there for about 5 months. The tasks the committee deals with are new and too foreign to me. Though I can ask around to gather more information about the issues with students and courses, I did not proactively participate in the committee activities because I was too busy with my first semester and establishing my research group. This is time to get out my comfort zone and eliminate excuses for not being active in my assignment.

Goals

1. Proactively participate in the undergraduate committee

The routine task of the committee is approving petitions and assessing the revisions to courses. In doing so, the knowledge of the department course flow chart is essential along with the concepts and skills taught in each course. I will read and learn the course concepts taught especially in non-chemical engineering courses. I will get used to the requirements for graduation and pre-requisite for each class to better serve students. I will also look for other courses that may replace currently recommended electives.

2. Volunteer for temporary committees / look for opportunities

   I will look for necessary changes or revisions to courses. For example, CH EN 263 underwent some revisions to materials by initiatives from my colleague, Dr. Lignell. Others also contribute to the courses and chemical engineering programs. Along the course of teaching, I will look for such opportunities. I will also volunteer for temporary assignments.

GETTING DIVINE HELP

I do not believe in asking my Heavenly Father for what I did not work on. I will sincerely ask for His guidance so I can change my character as a mentor and teacher. For me, getting knowledge and becoming good at teaching is a matter of time and practice. However, becoming an excellent teacher and mentor in delivering knowledge and a Christ-like example to students in influencing their lives require divine help. I will self-monitor my performance in keeping all the plans laid out in this documents. Then, I will ask for His help with confidence.

I will also seek for help in finding right topics for proposals after doing what I planned to do as described in this document. I will also pray for my graduate students and their families because my getting funding is directly related to their financial well-being. I will ask for success in getting funding after I do all I can do.

To confidently ask for His help, I will stay pure and strong in the Gospel and fulfil my calling(s).

Chemical Engineering 273

Chemical Process Principles (Material and Energy Balances)

MWF 10:00 – 10:50 am, 214 CTB

Instructor	Name 242E CB, 801-422-8570
Office Hours	Mon, Fri: 2:00 – 3:30 pm
Teaching Assistants	Name: Name@gmail.com Name: Name@gmail.com Name: Name@gmail.com
TA Hours	*To be determined*
Textbook	Elementary Principles of Chemical Processes, 4th Edition by Richard M. Felder, Ronald W. Rousseau, Lisa G. Bullard 3rd Edition is compatible with the classs.
Useful Link	R.L. Rowley, ChEn 273 Learning Resource Center http://www.et.byu.edu/~rowley/ChEn273/index.html
Course Objectives	A. Obtain a feel for what Chemical Engineers do B. Learn about basic chemical process units C. Learn to analyze and solve material balance problems D. Learn to analyze and solve energy balance problems E. Learn to analyze more complex balance problems involving coupling of material and energy balances for multiple units
Grades	1. Homework problems, Quizzes, In-Class Activities: 20% 2. Case study: 10% 3. First Exam (take-home): 10% 4. Second Exam (take-home): 15% 5. Third Exam (take-home): 20% 6. Final Exam (in-class): 25%
College Lectures	All ChEn 273 students are required to attend two College Lectures or equivalent. Alternate lectures are graduate student seminars, SWE speakers, or other approved outside speakers. Notify the TAs when you have attended each lecture. This will be worth ½ grade (A- vs. A). Please mark your calendars.
BYU Dress Code	All students are expected to fully support and adhere to all elements of the BYU dress codes. The codes will be enforced in the class room.
BYU Honor Code	All students in ChE 273 are expected to adhere to all elements of the BYU honor code. Each student is expected to submit for credit only that work

	of which he/she is the sole author (except for the case study). Students are encouraged to work in groups to discuss problems and possible solution ideas, but each student's work must represent his/her own thinking, labor, and understanding. The following are examples (but by no means an exhaustive list) of Honor Code violations: • Copying another student's work or an unauthorized answer key and submitting that copied material for credit as one's own work • Using any materials, either homework problems or exams, from previous years • Relying on the thinking and efforts of another person as a major guide in doing one's own homework without substantial effort to contribute one's own thought, labor, or understanding • Sharing electronic copies of homework (Mathcad files, Excel spreadsheets); please turn in separate sheets with original work • Obtaining unauthorized information during an examination, such as from the examination paper of another student or from unauthorized written material • Using false information to obtain undeserved permission or credit or to avoid a deserved penalty.
University Mission	Quoted from the General Catalog is: "The mission of Brigham Young University - founded, supported, and guided by The Church of Jesus Christ of Latter-day Saints - is to assist individuals in their quest for perfection and eternal life. That assistance should provide a period of intensive learning in a stimulating setting where a commitment to excellence is expected and the full realization of human potential is pursued. . . To succeed in this mission the university must provide an environment enlightened by living prophets and sustained by those moral virtues which characterize the life and teachings of the Son of God."
Sexual Harassment	BYU's policy against sexual harassment protects both employees of the University as well as students. Under Title IX of the Education Amendments of 1972, students who encounter sexual harassment from other students are protected. If you encounter sexual harassment or gender based discrimination, please talk to your professor; contact EEO office (422-5895); or contact the Honor Code Office (422-2847).
Students with Disabilities	BYU is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability, which may impair your ability to complete this course

successfully, please contact the Services for Students with Disabilities Office (422-2767). Reasonable academic accommodations are reviewed for all students who have qualified documented disabilities. Services are coordinated with the student and instructor by the SSD office. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures. You should contact the Equal Employment Office at 422-5895, D-282 ASB.

AIChE Code of Ethics

A. Fundamental Principles

Engineers shall uphold and advance the integrity, honor and dignity of the engineering profession by:

1. Using their knowledge and skill for the enhancement of human welfare;
2. Being honest and impartial and serving the engineering profession with fidelity;
3. Striving to increase the competence and prestige of the engineering profession.

B. Fundamental Canons

1. Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputations on the merits of their own service.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

Adopted by Council, August 16, 1980; based on ECPD Code of Honor, October 5, 1977.

I. CLASS MECHANICS

A. Homework Problems

Homework is an essential, integral part of this course because problem solving skills are obtained only by solving problems (lots of problems!). This is your major! Do all the homework! Do not assume that you have learned the material just because you can follow the instructor's solutions. Starting from scratch on a problem is a higher level of understanding than simply understanding how someone else worked the problem.

Homework rules:

1. Homework problems are due at the beginning of class. Please don't be late to class because you are finishing homework.
2. Homework may be turned in until the next exam without excuse for up to 50%credit. You may look at the answer key in the ChE office for guidance on late homework. Dr. Name will excuse late homework on a case-by-case basis. Please work the homework early to avoid lateness due to computer crashes.
3. Answer keys will be posted on the Learning Suite after class.
4. You may discuss with others how to begin working problems (in fact this is encouraged), but you must work the problem entirely yourself to hand in for credit. You may not share computer files for homework problems until the case study.
5. Homework should be written on one side only of 8.5" x 11" paper. Neatness is essential in developing good problem solving techniques. Points may be taken off for sloppiness.
6. Use of Mathcad, Excel or other computer programs will be permitted only when prescribed. This will be made clear on the class schedule.

B. Standard Homework Format

1. Organize work carefully and logically. Write legibly and neatly.
2. Carry units all the way through to the final answer. Units should appear on all numbers.
3. Carry algebraic expressions analytically as far as possible before substituting numbers.
4. Underline, box or otherwise mark results and answers.
5. Label your first page with a heading containing ChE 273, your name, assignment number, date and page. Subsequent pages should contain at least the page number and your name or initials.
6. Write on only one side of the paper (engineering paper is preferred).
7. Before turning in your assignment, staple all sheets together in upper left-hand corner. The TAs have requested that you do not fold the assignments.

C. Computer Problems

The computer is a valuable tool in this class and you should use spreadsheets, graphics packages, and programming languages. You should become conversant in MATHCAD or EXCEL, since they will be great tools for you in this class and throughout the chemical engineering curriculum. It is expected that you already know how to use MATHCAD and EXCEL because you should have taken CHEN 263. If you are a transfer student and are not familiar with MATHCAD, the teaching assistants will be glad to help you get started. Several problems assigned will require use of MATHCAD. You are free to use EXCEL on any of the other problems as you see fit; some restrictions apply on MATHCAD.

D. First Three Exams

Unless otherwise specified, the first three exams will be take-home. You are required to do the exams from 10:00 am (scheduled lecture start time).

E. Final Exam

The final exam for the course will be given on Tuesday, April 24 at 7:00 to 10:00 am in the regular classroom. It will be a comprehensive. Finals will not be given at any other time.

F. Reading Assignments

You are expected to keep up with the reading assignments on your own initiative. Assignments for each day of the entire course are listed on the attached schedule. You should read the assigned material before class. We will not remind you in class to do the reading. That does not mean it is not important. Generally, poor performance on exams is a result of not doing the reading. Quizzes will be given occasionally on the reading material at the beginning of class.

G. Case Study

Midway through the course the class will be divided into groups of 4-5 students. Your group will be assigned a case study to work on as a group. The case study involves balances on a process involving multiple chemical process units and is a good capstone problem for the course. Your group will interact with a consultant, either with me or with one of the TA's. I will introduce the case study and talk about the process in general, but then your groups will need to be self-motivated to meet regularly to discuss the problems and prepare a design for the project.

On the last day of class, you are to turn in the following items for grading of the case study:

(a) A completed case study report from your group showing the overall design of the process with appropriate stream tables, etc., and answers to questions. This should be done neatly and professionally. Only one report should be turned in for each group.

(b) Each individual should turn in a single page table that provides his/her confidential evaluation of the contribution of each group member.
An overall score will be assigned to each group's case study. Additional points will be added or subtracted depending on any clear evidence from the contribution evaluations that particular individuals made extraordinary or sub-standard contributions. Thus, individual scores may vary slightly within any one group.

H. TA Help Session

During the first week of class, we will schedule hours that the TA's will be available. You are encouraged to come by during those hours and seek help on problem assignments.

II. PROBLEM SOLVING PROCEDURES

Have you ever been trying to solve a problem (not necessarily a chemical engineering problem) and become totally lost in the middle of it, not really knowing where you've been or possibly not even remembering what it was that you were trying to solve for in the first place? CH EN 273 is a problem solving course and learning to attack a problem in an organized fashion is an important step in an engineer's education. To avoid the onset of panic caused when you get lost in the middle of a problem and to provide you with a generalized decision making scheme, I have outlined below the typical sort of procedures that I might use in attacking a problem. While I don't require you to memorize this procedure, I do expect that you will consistently set your problems up in the general fashion described below. You should begin to use this approach immediately in this class. As this approach becomes second nature to you, your problem solving capabilities will be greatly enlarged and (importantly) you will be able to attack material and energy balance problems with a great deal of self-confidence.

General Problem Solving Approach

A. DEFINE

1. Draw a sketch of the problem.
2. Label the sketch with flows and composition for each steam.
3. Put all known values of compositions and flows on the sketch.
4. Select a basis of calculation.
5. List the unknown stream quantities with symbols.
6. Identify exactly what you are being asked to calculate.

B. EXPLORE

1. Select the system boundaries.
2. Determine the degrees of freedom and the number of equations to be solved.
3. Obtain the necessary data and physical properties.

4. Identify possible attacks.
    i. Use equations with fewest unknowns first.
    ii. Use tie-components if appropriate.
    iii. The overall balance should generally be used.
    iv. Relocate the basis if necessary.
    v. For multiple units, start with the unit which has the lowest degree of freedom.
5. Write down independent balance equations for the chosen attack.

C. SOLVE
1. Solve simultaneous equations.
2. Scale-up from the chosen basis.

D. CHECK
1. Check your answers by direct substitution.

III. Competencies.

This course will help students should accomplish the competency expectations listed on the next page.

Level 3 competencies: Fundamental concepts that all chemical engineers should know. The Level 3 Competency exam must be taken and passed during the senior year of chemical engineering as a graduation requirement. This exam includes a total of twenty-four Level 3 competencies, including the Level 3 competencies from this class.

Level 2 competencies: Important concepts that will be taught. Measurements of student learning will include homework and exam questions. These often include more complex material.

Level 1 competencies: Students are exposed to the material, but there is no minimum performance expectation.

You will be asked at the end of the course to evaluate how competent you feel with the expectations listed on the next page.

I=Introductory, M=Main place where material is presented, P=Programmatic material, R=Review

Level	Usage	Competency Expectation
3	P	Students will demonstrate an ability to solve engineering problems.
3	M	Students will be able to use basic engineering units in both SI and AES systems in solving problems, and be able to convert between unit systems both by hand and with an equation solver.
3	M	Students will be able to solve steady-state, overall, material and energy balances for systems which include one or more of the following: recycle, multiple units, chemical reactions.
3	M	Students will understand the phase behavior of pure substances in relationship to the variables T, P, and density (including vapor pressure, critical point, freezing line, triple point, etc.).
3	M	Students will be able to use the mechanical energy balance equation to solve fluid flow problems both with and without friction.
3	M	Students will be introduced to the first law of thermodynamics for closed and open systems.
3	M	Students will understand and be able to use the extent of reaction in material balances
2	R	Students will be able to solve numerical and symbolic problems using advanced math software (e.g. Mathcad).
2	P	Students will exhibit critical and creative thinking skills for analysis and evaluation of problems and cause-effect relationship.
2	P	Students will be able to obtain and evaluate appropriate input information/data from databases, handbooks, correlations, experiments, literature, etc.
2	P	Students will be introduced to the notions of rationalizing units, making order of magnitude estimates, assessing reasonableness of solutions, and selecting appropriate levels of solution sophistication.
2	P	Students will be introduced to how safety considerations are incorporated into engineering problem solving.
2	P	Students will be introduced to how environmental considerations are incorporated into engineering problem solving.
2	P	Students will practice good teamwork principles.
2	M	Students will learn about chemical processes, units, and corresponding equipment.
2	M	Students will be able to set up and solve simple transient material balances.
2	M	Students will be able to use a degree-of-freedom approach to assist in the solution of material and energy balances.
2	M	Students will be able to read mixture phase diagrams (solid solubility, liquid-liquid, VLE) and construct mass balances from them using the lever rule, tie lines, etc.
2	M	Students will be able to solve simple fluid statics problems (e.g., manometers, fluid head, etc.).
2	M	Students will be able to apply Raoult's law to solve VLE problems including bubble point, dew point, and flash calculations.
2	M	Students will be introduced to equations of state and corresponding states correlations.
2	M	Students will be introduced to the concepts of heat capacity, latent heat, heat of reaction, heat of combustion, and heat of formation.
2	M	Students will be introduced to process variables (e.g., P, T, flow rate, conc.) and their measurement.
2	M	Students will be able to use a problem solving strategy to define and solve engineering problems.
2	M	Students will demonstrate experience working together in teams.
2	I	Students will be introduced to calculations involving work in turbines, compressors, and pumps.
2	I	Students will be introduced to the AIChE code of ethics.

Scholarship Strategies Project

Name, Assistant Professor
Chemical Engineering Department
Brigham Young University

* This document is to be read along with the Scholarship part of my Faculty Development Plan.

Research is my passion and one of the key reasons why I chose to be a professor. Research helps me feel satisfied with my work and gives me fun for my career. I plan to be an expert in wetting phenomena while I explore other areas of interfacial science. While many suggest professors have to change their research fields every five to six years, I will adhere to wetting phenomena throughout my career. In short term, I will focus on bijels and wetting transition, and publish two papers during 2019. The data set for the paper regarding wetting transition will be ready by February 2019.

At BYU, being an excellent researcher is good but there is more to it; educating students and assisting them in learning how to help others in their profession and communities. I will involve undergraduate students in my research, starting with routine lab work to developing ideas for grant proposals.

Goals by the End of February 2019

1. Writing three proposals

   There are currently two areas I am focusing on; bijels and the replacement of oil-filled cavities with water. I will write two proposals with these themes. I will write one more proposal regarding the topic I will hereafter describe.

   1) Bijels

      Bijels is a new class of material which can be used in many different applications such as fuel cell templates and liquid consumer products. Currently, my graduate student is working on this project in copying someone else's work. With trials and errors, we identified several factors which affect the stability of bijels. In the next several months, we will continue to fail and find out the reason for failure, which will help us identify other factors.

      With the preliminary results, we will write a proposal to be submitted to NSF Designing Materials to Revolutionize and Engineer our Future (DMREF) program. This project will have two parts: computational and experiments. The goal of this project is 1) to prepare phase diagrams identifying the stable bijel regions with which the right

combinations of liquids and solid particles are prescribed with computer simulations, then 2) to prepare bijels physically with experiments to prove that the simulations are correct. Therefore, I need both computational scientists and experimentalist. I will be the experimentalist while Dr. Doug Tree in the Chemical Engineering Department will the computational scientist. By working together, we will prepare the proposal due by January 2019.

2) Replacing initially oil-filled cavities with water

This is a part of my wetting transition projects I plan to study for a long time. The goal of this project is to identify factors which would promote or retard the rate of replacement of oil (or hydrocarbon) initially occupying micro-cavities with bulk water. The factors to be identified and tested will help clean up oil spills, design consumer products, and conserve the environment by using less chemical.

The proposal to be prepared will be submitted to Particulate and Multiphase Processes program of NSF CBET. My graduate student already prepared silicon wafers with micro-cavities and performed initial experiments. With these preliminary results, I will write a proposal to which I am a sole PI.

3) Effect of fluid flow parallel to surface on pinning and contact angle hysteresis

While I was still working on my postdoctoral projects at UCSB, I found out that fluid flow parallel to the porous surface increases the chance of wetting transition and but induces pinning. I also studied the change in the electrochemical forces between crude oil and oil well bedrocks (especially calcite) due to the change in the salt water concentration. With these two facts combined, I will study the pinning and contact angle hysteresis of oils droplets surrounded by salt water (sea water) when the droplets are moving approximately parallel to the porous surfaces. In addition, the fluid flow around the edges of and inside the cavities will be studied. The proposal for this project will be submitted to ACS PRF (Petroleum Research Fund) which is due in October 2018.

2. Preparing data for publication

From “Replacing initially oil-filled cavities with water” project (or wetting transition project), I will prepare all the data needed for writing one paper by February 2019. This project is to identify the variables affecting the rate of replacement. I will investigate the effect of temperature, contact angle, and surfactant.

For bijels project, my goal is to prepare bijels with smaller characteristic channel dimensions. Referring to previous publications I will find a way to decrease the channel diameter of bijels for further applications to MEMS and NEMS.

3. Involving undergraduate students

   I will look for one undergraduate student to work with during Fall 2018 semester and another for Winter 2019. The student who will join in Fall 2018 will work on the wetting transition project and the one in Winter 2019 will work with bijels project. With the help of my graduate students, they will obtain hands-on experiment protocol and safety principles. They will be integrated into research meetings in building paths to the success of the projects and providing ideas for new funding.

4. Finding collaborators / Conference Attendance

   I will find at least two very potent collaborators inside BYU Provo from whom I can be benefit and to whom I can benefit. The persons I will actively look for are the one whose disciplines are close to mine, but I will not limit my search in a narrow spectrum. I will especially look for professors in biology fields as my long-term goal is studying biological materials. I will attend at least one conference to find external collaborators. I am fortunate to have many acquaintances in my research field. I will turn several of them into my collaborators

Building habits

In Faculty Development Plan, I described two habits I like to build: habit of writing and habit of reading. I will assess myself qualitatively about the difference in my habits in writing and reading when myself now is compared to myself in February 2019.

Measure of Success

Based on what I wrote in this documents, my scholarly project is considered successful if I do followings by February 2019: (1) Submit 3 proposals, (2) Be ready for one publication, (3) Work with two undergraduate students, (4) Find two collaborators within the campus (5) attend one conference, and (6) Obtain increased tendency of continual reading and writing

Citizenship Project Proposal

Set in June 2018 by
Name, Assistant Professor
Chemical Engineering
Department Brigham Young
University

* This document is to be read along with the Citizenship part of my Faculty Development Plan.

I recognize we, faculty members, are to reach out to people in and out of our own communities; whether it be the department, college, or university. In addition, it is very well-known and proved that collaboration brings higher productivity and new ideas for teaching and research. Moreover, since BYU is a special place which is to impact student and go forth to serve, outreach activities should be considered.

With these in mind, I present my very short-term goals to be completed by the end of 2018 with details, followed by my other goals which I plan to achieve around my third-year review. For my short-term goals, I will focus on improving my performance/participation in my current assignment, continually attending Teaching and Learning seminar, and finding at least two professors/researchers to collaborate within BYU.

Goals by the End of 2018

1. Proactively participating in the undergraduate committee

   The routine task of the committee is approving petitions and assessing revisions to courses. In doing so, the knowledge of the department course flowchart and pre-requisite is essential along with the concepts and skills taught in each course. I will read and learn the course concepts taught especially in non-chemical engineering courses. I will also look for other courses that may replace currently recommended electives.

   In addition, I will look for necessary changes to courses. For example, CH EN 263 underwent some revisions to materials to be taught by initiatives from my colleague, Dr. Lignell. Others also contribute to the courses and chemical engineering programs. Along the course of teaching, I will look for such opportunities.

2. Attending Teaching and Learning seminars and implementing new ideas.

   During Winter 2018 semester, I have attended all but one Teaching and Learning seminars offered by the college. It was apparent that the seminar organizers and presenters spent a lot of time preparing for each seminar. They provided great action ideas in helping the participants apply the principles presented during the seminar. However, I did not have a chance to actually implement the ideas they suggested. Therefore, my focus will be

attending all of those seminars, take notes about the action items they suggest, and implement at least one idea during Fall 2018 semester. Since the seminars are offered during the semester, I will gather feedback from the students in CH EN 433 class (my assignment for Fall 2018) after I implement the idea.

3. Finding collaborators

   By psychological definition, I am not an extrovert, who gains energy from communicating with others. I enjoy interaction with other scientists and engineers, but sometimes it is hard for me. I will overcome my natural tendency of thinking within myself and communicating via literatures, and overcome the tendency by finding at least two professors within BYU Provo campus and chatting with them about their ideas and mine to find the crossing points.

<u>Goals to achieve in a longer term.</u>

Here I present ideas that require longer and steady preparation which would delight me immensely by achieving them.

1. Interfacial Science / Soft Material Group
   I like to form a group of BYU professor, even with UVU and U of Utah professors, whose interest lies in interfacial science and soft matters. This will increase chances of collaboration, chances for funding, and one of my teaching goal of developing an interfacial science course.

2. Outreach
   I like to reach out to K-12 students far from major university campuses. I realized students who live far from major universities lack opportunity for STEM outreach services. I plan to contact high schools in Ephraim, Manti, Moab, and other small Utah cities for their interest and develop an outreach program possibly with the group mentioned above.

Teaching Grant Proposal

Set in June 2018 by
Name, Assistant Professor
Chemical Engineering Department
Brigham Young University

For the upcoming two semesters (Fall 2018 and Winter 2019), I will implement “three-minute presentations” in which students in my class would volunteer to give a three-minute-long presentation about anything they learn from the previous class. The best way to learn something is to teach the thing. With this chance they would review the entire material from the previous class to be able to choose one small concept or principle. This will increase the retention of their knowledge.

With $300 fund, I will buy small gifts (full-size candy bars, stationeries, around $75 per semester) for those who volunteer to present. After each class they will have a chance to vote for the quality of the presentation of the day. After the last class of the semseter, the one with the highest rating will be awarded with $75 BYU Bookstore gift card to be used for the purchase of any textbook for the semester following.