Name	Department	Date
Kuangchiu Joseph Ho	Chemistry & Chemical Biology	April 20, 2015

Educational History:

Bachelor of Science in Chemical Engineering (Presidential Honor, 1983) Department of Chemical Engineering, National Taiwan University of Technology, Taipei, Taiwan, Republic of China.

Master of Science (1989) Department of Chemistry and Geology, Minnesota State University, Mankato, MN, major in Biochemistry, specialized in Enzymology, Thesis title: "A New Assay for 1-aminocyclopropane-1-carboxylate Synthase". Thesis Advisor: Dr. Jim Rife.

Ph.D. (1993) Department of Chemistry, University of New Mexico, Albuquerque, NM, major in (Biophysical) chemistry, Dissertation title: The theory and application of inverse light scattering problems by using Mueller Matrix measurements, Dissertation advisor: Dr. Fritz Allen

Employment History – principal positions since the Bachelor's degree

Research professor: 2010-present, University of New Mexico
Director of Chemical Education: 2010-present, University of New Mexico
Principal Lecturer III: 2012 - present, University of New Mexico
Lecture III: 1994 – 2012, University of New Mexico
Adjunct Professor: 2007 – 2010, University of New Mexico
Lab Director: 1996 – present, University of New Mexico
Senior Research Scientist: 2006 – 2011, University of New Mexico
Research Scientist: 1996 – 2006, University of New Mexico

Short Narrative Description of Teaching, Research and Service Interests

My research interests are in the studies of how people learn chemistry and the development of effective practices in the formal and informal chemical education. I believe any study in how people learn should be accompanied by the development of practices. Therefore, my research is on the balance of the theory and practice. Consequently, my research interests are also my teaching interests.

My research interests can be found in three large areas of chemical education: Laboratory learning, active learning, and learning with assessments. My current interests in these areas are summarized in the following:

Laboratory learning by emerging

An effective approach of learning a foreign language is by emerging the learners in the environment where they must speak the new language. Likewise, students in their science training should also be emerged in the environments to practice what a scientist would do. Laboratory is where many chemists are at work. However, our laboratory training for undergraduate students is far from what a real chemist is doing. In most laboratory courses our students are only required to follow written protocol and write reports for the results they have already known without an experiment. We have overemphasized the practice of lab procedures and student's psychomotor skills. According to the most recent NAEP report card for science, 80% of students can carry out the correct experiment,

but only 36% can correctly interpret the result. We have failed to provide adequate training for science that enables our students to work as a scientist. My research interest focuses on the identification of the key elements a chemist does at work, and how to provide effective training of these elements in our undergraduate laboratory courses. Many of my previous works have been presented at BCCE, HEAR-NM, and more will be published in high impact peer review journals.

The role of visualization in student's learning chemistry concepts and laboratory practices

Pictures or videos can provide much more information than what can be provided by text or lecture. However, richer information does not necessarily mean better learning. My interest in this area is the studies of how students learn from textbook images, supplemental videos, animations, lab videos and simulations. My goals from these studies are to provide useful guidance for the future development and the use of visualization for effective learning in chemistry. Some works have been presented at BCCE and more will be published.

Engaging students in active learning of difficult concepts of chemistry

One of the biggest roadblocks of learning new concepts is misconceptions. It is often that difficult concepts for students are rooted in misconceptions, but not the nature of the concepts. I am interested in the studies of how to identify and remove the underlying misconceptions of difficult concepts in undergraduate chemistry courses. I am also interested in the studies of other factors causing student's learning difficulties of chemistry, and the strategies to overcome these difficulties.

How do students view assessments in their learning process? Can students learn from mistakes?

Our general impression from students regarding assessments is usually on the negative side. However, research and experience have shown that assessments can be a powerful tool for learning. I am interested in the studies to provide evidence about student's conception about assessments and how their conception affects their learning from the results of the assessments.

The development of diagnostic concept inventories for chemistry

My work in this area has started in the fall of 2011. Two versions of the inventories for the first and second semester of general chemistry have been developed and implemented. My future work will extend the development and research to the laboratory courses and upper division chemistry courses. The goal is to implement these diagnostic assessments to key courses for instructors to obtain information about student's mastering of various concepts prior to taking the next course.

The study of pre-testing effect on student learning

The recent advancement in biological neuroscience provide evidence for how pre-testing improves student learning. Our data from the use of pre-semester ALEKS exercises showed strong pre-testing effect. My interest in this effect is on how the characteristics of exercises or testing influencing the student learning. How do we choose the right type of pre-semester exercises to produce desirable performance by students?

TEACHING ACHIEVEMENTS

Classroom Teaching: (only the last five years listed)

Served **11067** students between 2008 and 2012

semester	course number	sections	Title	format	number of students
Fall 2012	CHEM 123L	10 to 42	General Chemistry I	Lab	688

Fall 2012	CHEM 124L	11 to 25	General Chemistry II	Lab	293
Fall 2012	CHEM 131L	11 to 12	Principles of Chemistry	Lab	16
Fall 2012	CHEM 123L	44	General Chemistry I online	Lab	12
Fall 2012	CHEM 495L	5	Undergrad problem		2
Fall 2012	CHEM 500	1 to 2	Scientific Teaching in Chemistry	lecture	35
Summer 2012	CHEM 122	1	General Chemistry II	lecture	48
Summer 2012	CHEM 123L	11 to 13	General Chemistry I	Lab	45
Summer 2012	CHEM 123L	15	General Chemistry I online	Lab	3
Summer 2012	CHEM 124L	11 to 13	General Chemistry II	Lab	45
Summer 2012	CHEM 253L	11 to 12	Quantitative Analysis	Lab	26
Spring 2012	CHEM 123L	10 to 42	General Chemistry I	Lab	473
Spring 2012	CHEM 124L	11 to 25	General Chemistry II	Lab	440
Spring 2012	CHEM 132L	11 to 12	Principles of Chemistry	Lab	18
Spring 2012	CHEM 253L	11 to 15	Quantitative Analysis	lab	13
Spring 2012	CHEM 392L	5	Undergrad problem		1
Spring 2012	CHEM 496L	5	Undergrad problem		1
Spring 2012	CHEM 500	1 to 2	Scientific Teaching in Chemistry	lecture	27
Fall 2011	CHEM 123L	10 to 42	General Chemistry I	Lab	756
Fall 2011	CHEM 124L	11 to 25	General Chemistry II	Lab	307
Fall 2011	CHEM 131L	11 to 12	Principles of Chemistry	Lab	26
Fall 2011	CHEM 411L	1	Physical Chemistry	Lab	7
Fall 2011	CHEM 495L	5	Undergrad problem		2
Fall 2011	CHEM 500	1 to 2	Scientific Teaching in Chemistry	lecture	29
Summer 2011	CHEM 122	1	General Chemistry II	lecture	66
Summer 2011	CHEM 123L	11 to 13	General Chemistry I	Lab	47
Summer 2011	CHEM 124L	11 to 13	General Chemistry II	Lab	57
Summer 2011	CHEM 253L	11 to 12	Quantitative Analysis	lab	12
Spring 2011	CHEM 123L	10 to 42	General Chemistry I	Lab	494
Spring 2011	CHEM 124L	11 to 25	General Chemistry II	Lab	447
Spring 2011	CHEM 132L	11 to 12	Principles of Chemistry	Lab	16
Spring 2011	CHEM 253L	11 to 15	Quantitative Analysis	lab	72
Spring 2011	CHEM 315L	1	Undergrad problem		59
Spring 2011	CHEM 650L	5	Undergrad problem		1
Spring 2011	CHEM 500	1 to 2	Scientific Teaching in Chemistry	lecture	22
Fall 2010	CHEM 123L	10 to 42	General Chemistry I	Lab	637
Fall 2010	CHEM 124L	11 to 25	General Chemistry II	Lab	287
Fall 2010	CHEM 253L	11 to 15	Quantitative Analysis	Lab	64
Fall 2010	CHEM 315L	44	Introduction to physical chemistry	lecture	72
Fall 2010	CHEM 495L	5	Undergrad problem		1
Fall 2010	CHEM 454	1 to 2	Scientific Teaching in Chemistry	lecture	25
Summer 2010	CHEM 122	1	General Chemistry II	lecture	52
Summer 2010	CHEM 123L	11 to 13	General Chemistry I	Lab	54
Summer 2010	CHEM 124L	11 to 13	General Chemistry II	Lab	41
Summer 2010	CHEM 253L	11 to 12	Quantitative Analysis	Lab	10
Summer 2010	CHEM 454	2	Scientific Teaching in Chemistry	lecture	3
Spring 2010	CHEM 123L	10 to 42	General Chemistry I	Lab	456
Spring 2010	CHEM 124L	11 to 25	General Chemistry II	Lab	416
Spring 2010	CHEM 253L	11 to 15	Quantitative Analysis	Lab	58

Spring 2010	CHEM 496L	5	Undergrad problem		2
Spring 2010	CHEM 545	2	Scientific Teaching in Chemistry	lecture	33
Fall 2009	CHEM 123L	10 to 42	General Chemistry I	Lab	669
Fall 2009	CHEM 124L	11 to 25	General Chemistry II	Lab	246
Fall 2009	CHEM 253L	11 to 12	Quantitative Analysis	Lab	77
Fall 2009	CHEM 315L	44	Introduction to physical chemistry	Lab	84
Fall 2009	CHEM 411L	1	Physical chemistry	Lab	5
Fall 2009	CHEM 496L	5	Undergrad problem		2
Fall 2009	CHEM 650	5	Scientific Teaching in Chemistry	Lecture	1
Summer 2009	CHEM 253L	1	Quantitative Analysis	lecture	28
Summer 2009	CHEM 123L	11 to 13	General Chemistry I	Lab	54
Summer 2009	CHEM 124L	11 to 13	General Chemistry II	Lab	48
Summer 2009	CHEM 253L	11 to 12	Quantitative Analysis	Lab	27
Spring 2009	CHEM 123L	10 to 42	General Chemistry I	Lab	415
Spring 2009	CHEM 124L	11 to 25	General Chemistry II	Lab	386
Spring 2009	CHEM 253L	1	Quantitative Analysis	lecture	74
Spring 2009	CHEM 253L	11 to 15	Quantitative Analysis	Lab	73
Spring 2009	CHEM 496L	5	Undergrad problem		5
Fall 2008	CHEM 123L	10 to 42	General Chemistry I	Lab	544
Fall 2008	CHEM 124L	11 to 25	General Chemistry II	Lab	221
Fall 2008	CHEM 253L	1	Quantitative Analysis	lecture	76
Fall 2008	CHEM 253L	11 to 12	Quantitative Analysis	Lab	76
Fall 2008	CHEM 331L	1 to 2	Physical chemistry	Lab	6
Fall 2008	CHEM 332L	1 to 2	Physical chemistry	Lab	1
Fall 2008	CHEM 495L	5	Undergrad problem		1
Fall 2008	CHEM 496L	5	Undergrad problem		2
Summer 2008	CHEM 122	1	General Chemistry II	lecture	73
Summer 2008	CHEM 121L	11 to 13	General Chemistry I	Lab	55
Summer 2008	CHEM 122L	11 to 13	General Chemistry II	Lab	73
Summer 2008	CHEM 152	1	General Chemistry II	lecture	1
Summer 2008	CHEM 152L	11	General Chemistry II	Lab	1
Summer 2008	CHEM 253L	11 to 12	Quantitative Analysis	Lab	18
Summer 2008	CHEM 495L	5	Undergrad problem		2
Spring 2008	CHEM 121L	11 to 13	General Chemistry I	Lab	413
Spring 2008	CHEM 122L	11 to 25	General Chemistry II	Lab	400
Spring 2008	CHEM 253L	11 to 15	Quantitative Analysis	Lab	77
Spring 2008	CHEM 332L	1	Physical chemistry	Lab	12
Spring 2008	CHEM 496L	5	Undergrad problem		4

Undergraduate Student Mentoring: (Only partially listed)

Nabil Khan, LeDonna Malone, BS August 1999 to Summer 2000. Grant project: "Integration of Freshman Lectures, Laboratories and Bridges" funded by NASA PUSUE program. PP-45-99SU.

Nabil Khan, Kelly Kolinsky, Jeremiah Wright, Sarah Brunette, Eva Angeli, Stephanie Ford, Jeremiah Wright, Melissa Maes, August 2001 Summer 2002, Grant project: "Integration of Freshman Lectures, Laboratories and Bridges" funded by NASA PUSUE program. PP-45-02SU.

Ted Ortiz, June 2001, Grant Project: "Preparing Students for Quantitative Analysis Lab: Developing an Interactive Virtual Lab". Funded by NASA PUSUE program. PP-117-01SU.

Nabil Khan, Jennifer Coughlin, Virginia Necochea, June 2001, Grant Project: "Preparing Students for Quantitative Analysis Lab: Developing an Interactive Virtual Lab". Funded by NASA PUSUE program. PP-117-01SU.

Jennifer Brunson, June 2001, Grant Project: "Preparing Students for Quantitative Analysis Lab: Developing an Interactive Virtual Lab". Funded by NASA PUSUE program. PP-117-01SU.

Samuel Adam Smith, August 2005, Sam has started working as a lab assistant in my lab developing experiments for general chemistry lab. He later switched his major from architecture to chemistry and graduated with a BA degree. He then was admitted to the Science Teacher program pursuing his Master degree in education with the emphasis of STEM education.

Briana Van Treeck, August 2009 to June 2012, BS, Development of a parachute course for general chemistry students and teaching high school students in college chemistry lab.

Paul Hunt, August 2008 to June 2012, BS, in the development of his teaching skills for general chemistry lab and the parachute course. He has been admitted to many medical schools and studied at UNM medical school.

Alicia L. Leibowitz, August 2009 to May 2010, BS in biochemistry. Alicia worked with me for Supplemental Instruction assisting CHEM 253 Quantitative Analysis courses. We were working on the SI materials and searching for the best way of mentoring students in these classes.

Wilson William, August 2010 to July 2011, Ph.D., The study of the effectiveness of Calibrated Peer Review in Writing and Critical Thinking. The results were published in his Ph.D. dissertation. A paper to peer review Journal is in writing.

Marshall Caraveo, 2009 to 2011, B.S., He has been my students in CHEM 122 and CHEM 315, TA for CHEM 123L and 124L. After his graduation, he went to Northwest for graduate school and now a medical student at UNM Medical School.

Amber Leigh Ortiz, August 2010 to June 2012, BS, as her mentor for the courses and research in biomedical sciences. She has been meeting with me every semester and taken research courses with me before she graduated. She is currently pursuing her Ph.D. degree at another graduate school.

Ginger Culpit, June 2011, she started as my student in CHEM 122 and then was hired to teach and develop the parachute course for general chemistry students. She is currently teaching the parachute course (CHEM 120) and waiting for medical school admission.

Paul Lesko, January 2012, Paul was a non-traditional pre-med student. He wanted to be trained in teaching and leadership as a preparation to the medical school. I assigned him to teach our general

chemistry lab and specifically working with the BA/MD students. His interpersonal skills has improved greatly.

Jake Greenberg, Katelin Hartwig, Gail Hunt, Samana Tasnim, Lisa Richardson, Stephen Schreiner, Stephen Williams, Adam Henrie, Sam Blomquist, Charlie Villanueva, Justin T. Nakagawa, Brent Gallespie, Sara Swiderek, Hannah Martinez, Zeke Mares, 2009 to 2012 These students have at least 2 semester's training in teaching general chemistry lab with weekly training sessions and 10 to 20 hours field teaching time. They are trained especially for how to engage students in discussions and presentations.

Melanie Dugas, 2010, BA, she has been trained in teaching general chemistry lab and assisting international TAs in communication skills and understand American culture. She also has the passion to establish tutoring service for high school students for chemistry.

Sarah Toews, 2012-2014, Ph.D. A research topic in chemical education as part of her dissertation. She has been a teaching assistant for four years under my direct supervision.

Nicholas Keyes, 2014-2015, BS Chemistry**.** He worked on research of ALEKS and pretesting effect on student learning as his honor's thesis.

Curriculum Development or Teaching Administrative Positions:

1. Renovation of Physical Chemistry Lab (CHEM 331L, 332L, 411L), 1996 – present

I took over the teaching of physical chemistry lab in 1996. The lab has only three major instruments made in 1970's. I wrote a teaching allocation grant to receive $5000 and a matching fund from Arts and Sciences to purchase the Department's first Raman teaching instrument. Since then, I have written proposals almost every year for teaching instrumentation and purchased 11 more major teaching instruments with more than $300,000 budget: 2 UV-VIS spectrophotometers, a spectrofluorometer, a FT-IR spectrometer, an AA, a HPLC, two voltammeters, a Differential Scanning Calorimeter, an ion chromatography, and a GC-Mass spectrometer.

I have also written 15 new experiments in physical chemistry for these instruments. These experiments covered the topics of thermodynamics, statistical mechanics, protein folding-unfolding, dielectric constants, calorimetry, protein-ligand bindings, kinetics, molecular orbital theory, molecular spectroscopy, chemical equilibrium, phase diagram, partial molar quantities, basic molecular modeling, viscosity, and Raman spectroscopy. In developing these experiments, I have been collaborated with several faculty member of the department.

A series of experimental techniques using various spectroscopic and chromatographic methods to monitor protein conformational changes I developed have been presented in the international conferences for chemical education (BCCE) in 2008 and 2010, and will be submitted to as a chapter of the ACS symposium book titled: "Teaching Bioanalytical Chemistry" to be published in 2013.

2. Redesign Senior Chemistry Lab course sequence (CHEM 321L, 322, 411L, 432L, and 453L)

I have been a member of the committee to redesign the senior chemistry lab sequence for our undergraduate program in 2007. In additional to participating in the discussion of how the sequence

is formed and implemented, I was also the person who designed the content of the new physical chemistry lab (CHEM 411L). The goals of the redesign was to streamline the content of these courses for better coordination, to reconsider the pre-requisites for each of these lab, and to improve the pedagogy of how these labs are taught. In this new sequence, each lab is taught with 50 minute lab lecture every week. The new sequence has been implemented in phases from 2008 to 2010.

3. Gateway Course (CHEM 121, 122, and 131/132) Redesign, 2012 -2016

I have been the leader of the CHEM 121 and 122 redesign teams invited to submit the proposal and selected by OSET to be their first group of Gateway Course Redesign projects. The goal of this project is to change our way of teaching general chemistry courses to improve students' success rate in these courses. We selected the active learning strategies as the new approach because all the research findings from active learning and our own experience in teaching these courses indicated lecture itself is not the most effective method. engaging students in active learning is an effective alternative to the lecture. We have made the first draft of the course materials during the summer of 2012, and are implementing the first pilot course with active learning pedagogy in the fall semester. The result of the assessments run between the pilot new course and the controlled old course of CHEM 122 will be used to make necessary adjustment of the first version of the course materials and setting. We will then implement the new format in more lecture sections in the spring and summer semesters until a transferrable course plan for active learning can be established. This project has the potential to change the concept of how we teach the Gateway courses, and demonstrates a workable model for other courses to follow.

4. Modernize General Chemistry Laboratory (CHEM 123L, 124L and SMLC Building plan) 1998 – 2012

In 1998, I started the process of modernization of general chemistry labs located in Clark Hall 109 and 207. I had developed twenty experiments for the two semester lab sequence and written two manuals for them. I also replaced some of the very old lab equipment and purchased new equipment for these experiments. After most of these experiments were implemented, I received the NASA PURSUE grant to refine the first semester's experiments and include the Bridge materials in the first two weeks of the semester to help underprepared students to remediate their deficiency.

In 2001, after our first implementation of the new experiments, I have adopted WebCT as our lab management system. I have placed experiment pictures and other lab materials on WebCT to facilitate student's learning. I have also started to require students to write procedural flowchart in their pre-lab exercises in an effort to improve their preparation of the experiments. In 2002, I added the requirement for students to submit data through WebCT to provide immediate feedback for instructors to view student's lab results.

I have revised the lab manuals every year to reflect on our changes to the lab and to improve our learning strategies in this course. During this time, we have systematically replaced most of our lab equipment until we had the new labs at SMLC.

In 2005, I have started to hire undergraduate TAs to teach our general chemistry lab. These undergraduate students have earned an A from the course and had interests in teaching. I gave them a training for the experiment and teaching in our weekly meeting. We also discussed issues related to student's learning in the meeting which resulted in the idea of using lab videos to replace the written manual procedures. Our goal was to engage students more in the lab procedure and steer them away from merely following the written procedure by rote. I therefore spend close to 2 years, from 2007 to 2009, to produce ten procedural videos for CHEM 123L and 124L. I also stripped

the written procedures from the manuals and expected students to write their own procedure by watching the videos. This change of lab format was the first step to make our labs inquiry-based.

In 2011, after two years of using lab videos, I have gradually removed the full procedural videos and replaced them with technique videos in an attempt to increase the element of experimental design in our labs. I have also revised the lab manual to change our presentation and requirement to our students. The experiments were changed from an expository nature to project based and inquiry based experiments. Students are presented with a chemistry question, and through the studies of manual materials, lab technique videos, and small group discussions, they design an experiment to collect data and observations to support their answer to the question.

The four new lab of general chemistry are also completed at SMLC in the spring of 2011, after almost three years of planning and design. I have participated and led the effort during the entire process. I have referenced many lab studio designs seen from BCCE in our design effort. I have also written and received a $300,000 funds from College of Arts and Sciences for the purchase of new lab equipment. Most of our experiments in these labs are computer-interfaced.

5. Modernize Departmental Teaching Instrumentation, 1996 – 2012

I started the renovation of physical chemistry lab in 1996 by writing a teaching allocation grant to inquire a Raman Spectrometer. I also worked with the Chair, Dr. Fritz Allen, to request additional funding from the college of Arts and Science to purchase laboratory equipment for three new experiments I wrote. I have since written 7 more new experiments for this course, presented a series of biophysical/bioanalytical experiments in the international conference of chemical education (BCCE), and purchased two UV-VIS spectrophotometers, a spectrofluorometer, a FTIR spectrometer, a HPLC, an Ion Chromatography, two electrochemical analyzers, and a differential scanning colorimeter, a total of more than 300K budget. As the result, the Department has a state of arts undergraduate teaching lab that can be used by all three senior laboratory courses. I am current working with faculty from other universities to rewrite the physical chemistry experiments for POGIL, and have been invited to write a book chapter for "Teaching Bioanalytcial Chemistry" to be published by ACS. In my future plan, I will continue revamping the instrumental analysis course in 2013-2014.

6. On-line Lab Report Submission System (CHEM 253L) 2002

One of the most difficult elements of our quantitative analysis lab is to accurately process data. This lab demands precision and accurate data processing. Because the data processing involves multiple steps, and the mistakes can occur during any single step of the process, it is difficult for an inexperienced student to identify the mistakes, and impossible for the instructor to spot the problem without seeing the original data and calculation steps. To help both students and instructor in this difficult task, I started to develop a web-based, password protected lab report system in 2002. This system consists of forms that students can use to submit their data as well as the key calculation values in the data processing. The forms can only be submitted if students' calculations were correct checked by a computer program during the submission process. All submitted data can be printed out or summarized in the system's database, available to the instructor for review. This system prevents student's incorrect calculations from being submitted. Students can also bring a printout of the unsuccessful submission to the instructor, which contains all data and information that are crucial for trouble-shooting.

The second generation of the original system is currently being used by CHEM 253L. In this

password-protected system, students can enter their experimental data and the calculated results by filling out the submission form. By pressing on the submit button, all their work will be checked and validated by a computer program. If any mistake was found, the student will be informed and the submission stopped without completion. Hints will be provided for possible places of mistakes from their calculation. They can work on correcting the mistakes and re-submitting the report. They can also bring the computer print-out to faculty for assistance. The computer print-out shows all data and results being submitted on one page which can provide a clear summary for faculty to review. The system makes the grading process fast and easy.

7. Conversion of General Chemistry Lab into Inquiry-Based (CHEM 123L, 124L, 131L, and 132L)

The pedagogy of college chemistry laboratory teaching has been traditionally expository, or a cook-book approach. In this approach, students are expected to perform lab techniques by rote and follow written protocol without much critical thinking. Our general chemistry lab has been using this approach prior to 2000 where I started the process of changing our lab from this approach. I took a conservative approach to the changes because the large student population (more than 2000 students per year) in this lab and the diversity of TA's teaching styles (international and domestic). All the changes have been accompanied by TA training.

This lab has gone through the following changes:

- Replacing lab datasheet with lab notebook and lab report
- Adding the requirement of procedural flowchart in the pre-lab report
- Adding the requirement of paraphrasing experimental procedure in the pre-lab report
- Adding lab practical exams to the lab assessments
- Replacing written procedure with lab procedural videos
- Using peer review to report writing using Calibrated Peer Review Web-based system
- Converting experiments from expository to problem-based
- Replacing procedural lab videos with lab technique videos to assist the students to learn experiment design
- Converting lecture based lab instruction to small group discussions and post-lab student presentations

8. Development and Implementation of TA Training and Evaluation, 1996 – present

Our general chemistry and organic chemistry lab courses (123L/124L/303L/304L) were taught by TAs due to large numbers of section offered. We also have high number of international TAs whose native language is not English. I recognized the importance of giving proper training for these TAs. Therefore, starting in 1996, I have developed an evaluation system based on faculty feedback and made recommendations for TA awards each year to encourage excellent teaching. I have developed TA handbook to provide guidance to the expectation of teaching and ethic of teaching (Attachment B). I also have developed the instructor's manuals for general chemistry lab TAs who constitute 60% of all the TAs. Traditionally, we asked TAs to prepare their lab teaching by coming to the lab during the week, before the sections they teach, to practice the use of lab equipment. Since we started to hire more undergraduate TAs, I saw the need to have a formal training for our TAs, especially in the correct operation of lab equipment and teaching skills. I started to have two day pre-semester training which included primarily the general chemistry lab TAs. Gradually, I have added other elements of the training, such as CPR/First Aids, safety training, and the diagnostic assessment of TAs chemistry knowledge.

During the years I developed the lab videos, I started to see the need for giving training in classroom and lab teaching methods to prepare our TAs for the teaching in an active learning environment. I have then attended many workshops for faculty development offered by OSET to learn more about teaching methods. I have also started seeking advice from faculty in Teacher education, and learned about inquiry-based teaching. I extended the pre-semester training to three days to include more sessions of teaching practices and invited faculty to speak about how to lead discussions and other issues about active learning. I also have cultivated the idea to offer a graduate course for teaching methods and use the course to evaluate TAs' teaching performance. I wrote the proposal for the course and received the approval from Faculty Senate Curriculum Committee. The detail of the course development can be found in the next item.

I have also worked on the TA evaluation system. The current system consists of fast feedback and teaching surveys. The purpose of the fast feedback is to provide a short and quick formative assessment of TA's teaching early in the semester so that TAs can improve upon their shortcomings. The teaching surveys are given twice in a semester by faculty and lab techs. The final survey determines TA's performance of the semester.

9. Development and Teaching of Scientific Teaching in Chemistry (CHEM 500) 2010 – present

As part of the TA training and evaluation, the proposed new graduate course was approved by the Faculty Curriculum committee in 2010 and has implemented in Chemistry graduate program as a required course for all graduate students on teaching assistantship.

Course Description:
"A seminar course to provide basic training of chemistry teaching techniques and education psychology to teaching assistants, pre- and in-service teachers. This course requires student to build a teaching portfolio containing course syllabus, learning objectives, grading examples, evaluations from students, peers, and faculty. The pre-service teachers build their portfolio by using teaching projects. (substitute teachings, holding office hours, grading assignments, etc). This course is one credit hour and may be counted toward undergraduate or graduate degree in chemistry, and science teaching degree in education."

10. Development of Parachute course for General Chemistry students (CHEM 192, 120) 2010 – present

I have helped the Chair of Chemistry and Chemical Biology in the development of a "parachute" course for general chemistry students who were in danger of failing the course to provide assistance in their learning and prepare them to retake the general chemistry course. After the implementation of the course in 2010, I have provided statistical analysis of students' performance in the course and a longitude study.

11. **Development of On-line general chemistry lab, summer 2012 – present**

By taking this course, we expect students to be able to

- Define the scientific questions to be investigated
- Write testable hypothesis for each experiment
- Collect observations from existing experiments
- Plan for experimental procedures
- Make correct decision on the selection of basic lab tools in the investigations
- Take safety precaution for working in the lab

- Record useful observations and data from the experiment
- Apply appropriate chemical principles to observations and data for the proper interpretation
- Present your data and conclusions in writing and or oral presentation
- Use basic statistics in experimental design, data processing, and drawing conclusion.

12. Development of a crash course for General Chemistry students (CHEM 115) 2013 – present

In an attempt to accelerate underprepared students to complete general chemistry sequence as a required course for STEM majors, I piloted a summer crash course in 2013. This course focused on math remediation and the application of math concepts on chemistry problems, review of key chemistry pre-requisite concepts, and metacognitive skills. To make the course more feasible for high school or freshman to take during the summer, this course takes on online format. In 2014, I started the use of ALEKS system as the main learning tool for students in this course. From 2014 data, students completing ALEKS before taking CHEM 121 have 100% passing rate. These students also have high percentage of earning an A. A research article is under preparation for publication in 2015 to disseminate the results.

Service:

Book Review:

Textbook review:

General Chemistry by Noel Zaugg
WEST Educational Publishing
February 1996

Herrinton/Dwyer, Chemistry, 1/e
Reviewed Chapters for the topics of equilibrium.
April 2004

Chemistry by Gilbert/Kirss/Foster/Bretz/Davies. 4th & 5th Edition
W.W. *Norton and Company*
June 2014 & March 2015

Virtual Lab review:
"LabSkills General Chemistry Techniques"
"LabSkills Organic Chemistry Techniques"
Brookes/ Cole Cengage Learning
June 2011

LearnSmart Lab review:
McGraw Hill Publication
December 2013 – February 2014

Inquiry Lab manual Review:
"Laboratory Inquiry in Chemistry", 3rd Edition, by Richard C Bauer, James, P. Birk, Douglas, J. Sawyer, ISBN-13: 978-0-495-11345-4, 2009
July 2012

UChemTeach Summer Chemistry teacher workshops and Mobile lab

I have established a teacher partner program called **UChemTeach** in 2010. The goal of this program is to promote excellent teaching in chemistry from secondary schools. I have given two week-long summer workshops.

Maintain UChemTeach mobile lab program for science teachers. I have also established a mobile lab to help teachers find lab equipment for their chemistry laboratory experiments. This program was one of 10 national recipients of the Vernier 30 year anniversary grant. Other supports include Cabot technology, and Pepsi funds.

Undergraduate Study Committee (as a member 2002-2011, as Chair 2012 – present)

I have served in the Departmental Undergraduate Committee. The major projects done with my involvement are the installation of Hurchest Celeny computer lab in 2000, the departmental program review in 2005, the revision of undergraduate program is 2007 including the new upper-division lab sequence. I am appointed as the Chair of this committee 2012-present.

SMLC Building Committee (Chair from Chemistry) 2009 – 2011

I have participated in the planning and designing of the Sciences and Mathematics Learning Center since 2008 as a representative from the chemistry department. I was the main designer of the four chemistry laboratories in SMLC. I have also written a proposal for the new labs and received $300,000 funds for lab equipment that goes to four new general chemistry labs.

Advisor, Pre-med student organization 2005, 2010

Advisor, New Mexico Advanced Placement Summer Workshop, 2000 to 2006, 2009

Judge, Central NM Regional Science fairs, Albuquerque Institute of Math and Science, St. Pius X High School, 2011, 2012, 2013, 2014, 2015

Scholarly Achievements (not all lecturers participate in scholarship in their disciplines, but for those who do, please list as described below:

1996 Development of experiments for general chemistry laboratory courses, including crystal structures, lithography, and freezing point depression. A model kit and two-dimensional lattice point patterns were also designed and made for the crystal lattice experiment.
1997 Development of experiments for physical chemistry laboratory courses and acquired funds to purchase new teaching instrumentation.
2000 Studies of using pictures to assist students' understanding of experimental procedures and implementation of laboratory website to host these lab pictures.
2001 Studies of using flowchart to help students better prepare for experiments in general chemistry labs.
2001 Development of lab supplemental website using WebCT course management system for general chemistry lab.
2002 Studies of the effect of paraphrasing experimental procedure as the prelab exercise to assist student preparation in general chemistry labs.
2003 Development of a series of protein-ligand binding experiments for undergraduate student research and physical chemistry lab experiments.
2004 Development of on-line data submission system with tutorial function for quantitative analysis lab. This included a MySQL-PHP server for the on-line report submission.
2004 Studying the effect of using Clicker in the classroom (CHEM 122)

2005 Development experiments for protein conformational studies using spectroscopic methods
2007 Development of experiments for protein conformational studies using ESI-MS chromatogram
2008 Development and Studies of using laboratory procedural videos to replace the text-based manual
2008 Development of Lab practical Exams in the general chemistry lab for the assessment of students' learning in the lab.
2010 Studies of the effectiveness of using Calibrated Peer Review for students' learning in the lab and feasibility study of using CPR as the tool for lab report writing
2011 Development of the active learning strategies of using lab discussions and presentations. This included the workshops in TA training.
2012 Development of Chemistry Concept Inventories and the studies of student's learning progress for CHEM 121 and 122.
2012 Team leader, Gateway Course CHEM 122 redesign project. The project was started in June of 2012 and is tentatively completed in the summer of 2013.
2012 Development of on-line chemistry lab that provides training for experimental design and interpretation of experimental data and observations.
2013 Team leader, Gateway Course CHEM 121 redesign project. The project was started in June of 2013 and is completed in the summer of 2014.
2013 Development of a preparatory course for general chemistry (CHEM 115) that serves as a pre-requisite course for CHEM 121/123L and accelerates STEM student's completion of general chemistry requirement.
2014 Research in the effectiveness of ALEKS as a pre-semester preparation of students in general chemistry course and on student course learning and course performance.
2015 Team member of the Gateway course redesign for CHEM 131/132 to serve as the assessment person for the project and student performance.

Books Authored or Co-authored:

1. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, first ed. Hayden McNeil Publishing, 154 pages, August 2000. ISBN 0-7380-0328-X
2. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, second ed. Hayden McNeil Publishing, 154 pages, August 2001. 0-7380-0385-9
3. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, third ed. Hayden McNeil Publishing, 154 pages, August 2002. 0-7380-0995-4
4. Joe Ho, Mark Ondrias, Dr. Don McLaughlin, Laboratory Experience, A manual for general chemistry I, fourth ed. Hayden McNeil Publishing, 154 pages, August 2003. ISBN 0-7380-0593- 2
5. Joe Ho, Mark Ondrias, Dr. Don McLaughlin, Laboratory Experience, A manual for general chemistry I, fifth ed. Hayden McNeil Publishing, 154 pages, August 2004. ISBN 0-7380-1376-5
6. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, sixth ed. Hayden McNeil Publishing, 154 pages, August 2005. 0-7380-1643-8
7. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, seventh ed. Hayden McNeil Publishing, 154 pages, August 2006. 978-0-7380-2173-7
8. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, eighth ed. Hayden McNeil Publishing, 154 pages, August 2007. ISBN 978-0-7380-2511-7
9. Joe Ho, Laboratory Experience, A manual for general chemistry I, ninth ed. Hayden McNeil Publishing, 154 pages, August 2008. 978-0-7380-3024-1
10. Joe Ho and Mark Ondrias, Laboratory Experience, A manual for general chemistry I, tenth ed. Hayden McNeil Publishing, 154 pages, August 2009. ISBN 978 -0-7380-3024- 1
11. K Joseph Ho, Laboratory Experience, A manual for general chemistry I, eleventh ed. Hayden McNeil Publishing, 154 pages, August 2010. ISBN 978-0-7380-3530-7
12. K Joseph Ho, Laboratory Experience, A manual for general chemistry I, twelfth ed. Hayden McNeil Publishing, 154 pages, August 2011. ISBN 978-0-7380-4764-5
13. K Joseph Ho, Laboratory Experience, A manual for general chemistry I, thirteenth ed. Hayden McNeil Publishing, 154 pages, August 2012. 978-0-7380-5469-8
14. Joe Ho, Laboratory Experience, A manual for general chemistry II, first ed. Hayden McNeil

Publishing, 154 pages, 2000. 0-7380-0346-8

15. Joe Ho, Laboratory Experience, A manual for general chemistry II, second ed. Hayden McNeil Publishing, 154 pages, 2001. ISBN 0-7380-0346-8
16. Joe Ho, Laboratory Experience, A manual for general chemistry II, third ed. Hayden McNeil Publishing, 154 pages, 2002. ISBN 0-7380-0499-5
17. Joe Ho, Laboratory Experience, A manual for general chemistry II, fourth ed. Hayden McNeil Publishing, 154 pages, 2003. ISBN 0-7380-0767-6
18. Joe Ho, Laboratory Experience, A manual for general chemistry II, fifth ed. Hayden McNeil Publishing, 154 pages, 2004. ISBN 0-7380-1098-7
19. Joe Ho, Laboratory Experience, A manual for general chemistry II, sixth ed. Hayden McNeil Publishing, 154 pages, 2005. 0-7380-1511-3
20. Joe Ho, Laboratory Experience, A manual for general chemistry II, seventh ed. Hayden McNeil Publishing, 154 pages, 2006. 0-7380-1779-5
21. Joe Ho, Laboratory Experience, A manual for general chemistry II, eighth ed. Hayden McNeil Publishing, 154 pages, 2007. 978-0-7380-2289-5
22. Joe Ho, Laboratory Experience, A manual for general chemistry II, ninth ed. Hayden McNeil Publishing, 154 pages, 2008. 978-0-7380-2667-1
23. Joe Ho, Laboratory Experience, A manual for general chemistry II, tenth ed. Hayden McNeil Publishing, 154 pages, 2009. ISBN 978-0-7380-3150-7
24. K Joseph Ho, Laboratory Experience, A manual for general chemistry II, eleventh ed. Hayden McNeil Publishing, 154 pages, 2010. ISBN 978-0-7380-3717-2
25. K Joseph Ho, Laboratory Experience, A manual for general chemistry II, twelfth ed. Hayden McNeil Publishing, 154 pages, 2011. ISBN 978-0-7380-4330-2
26. Lab Partner General Chemistry Lab Experiments, Freeman, 2009

Articles in Refereed Journals:

1. Ho, J., & Allen, F.S., "An approach to the inverse obstacle problem from the Mueller matrix", Inverse Problem, 10 (1994) 387-400

2. J. Wei, Q. Fu, H. Fan, J. Ho, W. Wang, “A highly Selective Fluorescence Probe for Thiophenols”, Angewandte Chemie Int. Ed., v46, 8445-8448, 2007

3. Z. Wang, K.J. Ho, C.J. Medforth, and J.A. Shelnut, “Porphrin Nanofiber Bundles from Phase-transfer Ionic Self-assembly and their Photocatalytic Self-metallization”, Advanced Materials, v18, 255-2560, 2006

4. K. Jospeh Ho, “Protein Conformational Study by Various Spectroscopic and Chromatographic Methods”, ACS Book Chapter in “Teaching Bioanalytical Chemistry”, American Chemical Society, edited by Harvey Hou. 2013

Other Writings:

1. K. Ho, " The theory and application of inverse light scattering problems by using Mueller Matrix measurements.", Ph.D. dissertation, University of New Mexico, Albuquerque, New Mexico (1993)

2. K. Ho, "A New Assay for 1-aminocyclopropane-1-carboxylate Synthase", Master's Thesis, Minnesota State University, Mankato, MN (1989)

Works in Progress:

Peer reviewed papers:

1. Wilson Williams and K Joseph Ho, "The Effectiveness and Feasibility Study of Calibrated Peer Review for Students in General Chemistry Laboratory", Journal of Chemical Education, ACS.
2. K Joseph Ho, "Engaging Students in Active Learning in the Large General Chemistry Laboratory Course". Journal of Chemical Education, ACS.
3. K Joseph Ho, "Concept Inventories for the First and Second Semester's General Chemistry Sequence as a Tool to Measure Students' Learning", Chemistry Education Research and Practice, Royal Society of Chemistry.
4. K Joseph Ho, "How Body Processes Alcohol, using real-world examples to teaching the concepts of kinetic, equilibrium, electrochemistry, and biochemistry", Journal of Chemical Education, ACS.
5. K. Joseph Ho, N. Keyes, The effect of pre-testing in the preparation of students for general chemistry course using ALEKS, Journal of Chemical Education, Chemistry Education Research and Practice, Royal Society of Chemistry.

Invited or Refereed Abstracts and/or Presentations at Professional Meetings:

1. Ho, K. LaDonna Malone, Justin Marbury, "**Integration of Freshman lectures, Laboratories and Bridges**", Second Annual PURSUE Student Conference, Albuquerque, New Mexico, 2001

2. **Could There Be A Better Way of Managing Assignment – Have You Tried WebCT Vista?**
   Conference: Success in the Classroom
   Place: University of New Mexico, Albuquerque, NM
   Date: Feb 29, 2006

3. **Introducing students to protein conformational stability using various spectroscopic methods and ESI mass spectrometry**
   Symposium Title: Novel Ideas in Bioanalytical Chemistry and Interdisciplinary Laboratories
   Conference: 20th Biennial Conference of Chemical Education (BCCE)
   Place: Indiana University, Bloomington, IN
   Date: July 28, 2008, 16:05 PM

4. **Engaging Students in Active Learning In the Chemistry Laboratory**
   Conference: Success in the Classroom
   Place: University of New Mexico, Albuquerque, NM
   Date: Feb 17, 2010

5. **Bioanalytical Chemistry for Teachers**
   Symposium Title: Bioanalytical Chemistry: Analytical Applications in Biological Sciences
   Conference: 21th Biennial Conference of Chemical Education (BCCE)
   Place: Northern Texas University, Commerce, TX
   Date: July 28, 2010, 16:05 PM

6. **Feasibility Studies of Using Calibrated Peer Review (CPR) in the Large General Chemistry Laboratory Courses**
   Conference: Success in the Classroom
   Place: University of New Mexico, Albuquerque, NM
   Date: Feb 29, 2011

7. **You Drink, You Drive, You Lose – Alcohol Metabolism**
   Seminar Presentation: UNM at Gallup
   Place: Gallup Campus
   Date: May, 2011

8. **Engaging Students in Experimental Design in Introductory Chemistry Laboratory**
   Conference: Success in the Classroom
   Place: University of New Mexico, Albuquerque, NM
   Date: Feb 29, 2012

9. **Active Learning in Instrumental Analysis**
   ACS 499th National Meeting in Denver
   Place: Denver, CO, Conventional Center
   Date: March 24, 2015, 4:00 PM

Contributed (un-refereed) Abstracts and/or Oral Presentations at Professional Meetings:

1. **Helping students process experimental data using on-line data submissions**
   Conference: 20th Biennial Conference of Chemical Education (BCCE)
   Place: Indiana University, Bloomington, IN
   Date: July 29, 2008, 13:30 PM

2. **An On-line System to Help Students Post-experiment Data Processing**
   Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
   Place: Albuquerque, NM
   Date: Feb 27, 2009

3. **Eyes-on and Hands-on Chemistry Lab Experience**
   Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
   Place: Albuquerque, NM
   Date: Feb 27, 2009

4. **Introducing Calibrated Peer Review in a General Chemistry Laboratory Course**
   Symposium Title: Calibrated Peer Review: New Developments and Uses
   Conference: 21th Biennial Conference of Chemical Education (BCCE)
   Place: Northern Texas University, Commerce, TX
   Date: July 28, 2010, 16:05 PM

5. **Eyes-on & Hands-on Chemistry Laboratory Experience**
   Conference: 21th Biennial Conference of Chemical Education (BCCE)
   Place: Northern Texas University, Commerce, TX

Date: July 29, 2010, 13:30 PM

6. **Development of a Parachute Course for College Chemistry**
   Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
   Place: Albuquerque, NM
   Date: Feb 24, 2011, 5:15 PM

7. **Can a parachute class save students from failing General Chemistry?: Year 2**
   Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
   Place: Albuquerque, NM
   Date: Feb 23, 2012, 5:15 PM

8. **Can a parachute class save students from failing General Chemistry?**
   Conference: 22th Biennial Conference of Chemical Education (BCCE)
   Place: Penn State University, State College, PA
   Date: August 2, 2012, 17:30 PM

9. **Engaging Students in Scientific Method in General Chemistry Laboratory**
   Conference: 22th Biennial Conference of Chemical Education (BCCE)
   Place: Penn State University, State College, PA
   Date: July 30, 2012, 17:30 PM

10. **A Search of Predicators for Student's Success in the Gateway Chemistry Course**
    Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
    Place: Albuquerque, NM
    Date: Feb 18, 2013, 5:15 PM

11. **What determines a successful parachute from General Chemistry?**
    Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
    Place: Albuquerque, NM
    Date: Feb 18, 2013, 5:15 PM

12. **Assessing Student Performance in A Laboratory Course**
    Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
    Place: Albuquerque, NM
    Date: Feb 18, 2014, 5:15 PM

13. **Assessing A Gateway Course Redesign**
    Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)
    Place: Albuquerque, NM
    Date: Feb 18, 2014, 5:15 PM

14. **A Year After the Redesign of General Chemistry**
    Conference: Success in the Classroom
    Place: University of New Mexico, Albuquerque, NM
    Date: Feb 23, 2015

15. **The Effect of Pre-semester Exercises on Student Success**
    Conference: New Mexico Higher Education Assessment and Retention Conference (NMHEAR)

Place: Albuquerque, NM
Date: Feb 18, 2015, 5:15 PM

Research Funding (while many lecturers do not participate in outside funding activity, some do, so an opportunity is provided to list those activities:

1993	Co-PI for Teaching Allocation Grants, the University of New Mexico ($5000)
1998-2001	PI for PURSUE program, NASA grant PP-45-99SU
2000	Co-PI for INTEL College Teaching Fund (20 desk top computers)
2001-2003	PI for PURSUE program, NASA grant PP-117-01SU
2002-2004	PI for WAESO-NSF ARIZONA grant for undergraduate minorities ($7750)
2009	Co-PI for UNM Teaching Allocation Grants for electrophoresis experiments ($5000)
2010	UNM Pepsi Funds for Science Teacher Summer Workshop. ($9000)
2011	CABOT Donation to UChemTeach Mobile Lab Teacher funds ($2500)
	Vernier Technology and Software Inc. 30-year anniversary grant ($10,000)
	SUMMER UChemTeach Summer Workshop funds ($2000)
	PI for WAESO-NSF ARIZONA minority undergraduate research assistant grants ($4000)
2012	Project leader for Gateway CHEM 122 Course Redesign (Salaries for five faculty members and a graduate student)
2013	Project leader for Gateway CHEM 121 Course Redesign (Salaries for five faculty members and a graduate student)
2015	Gateway CHEM 131/132 Course Redesign (Salaries for three faculty members and a graduate student)