



2nd Annual UC Davis Scholarship of  
Teaching and Learning Conference

CONFERENCE ABSTRACTS

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# Talks

## Using Student Annotated Hashtags and Emojis to Collect Nuanced Affective States

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### **Purpose**

Determining affective states such as confusion from students' participation in online discussion forums can be useful for instructors of a large classroom. However, manual annotation of forum posts by instructors or paid crowd workers is both time-consuming and expensive. In this work, we harness affordances prevalent in social media to allow students to self-annotate their discussion posts with a set of hashtags and emojis, a process that is fast and cheap.

### **Main Findings**

For students, self-annotation with hashtags and emojis provides another channel for self-expression and a way to signal to instructors and other students on the lookout for certain types of messages. This method also provides an easy way to acquire a labeled dataset of affective states, allowing us distinguish between more nuanced emotions such as confusion and curiosity. From a dataset of over 25,000 discussion posts from two courses containing self-annotated posts by students, we demonstrate how we can identify linguistic differences between posts expressing confusion versus curiosity, achieving 83% accuracy at distinguishing between the two affective states.

### **Description**

A hashtag feature was rolled out to NotaBene (NB) and used in summer and fall quarter iterations of a course at University of California, Davis titled Introductory Biology 2A. Each iteration of the course enrolls over a thousand students. Reading assignments from on-line textbooks were posted on NB, and course points were awarded for commenting in NB. From the two courses, 293,316 posts were made by 2,353 unique authors. From the discussions, we extracted all the posts that contain a hashtag in the text of the post. We experiment with four different classification algorithms and compare their performance. The algorithms we choose are Logistic Regression (LR), Support Vector Machines (SVM) with a linear kernel, Adaptive Boosted Decision Trees (ADT), and Random Forests (RF). We use 10-fold cross validation and average the results.

### **Relevance and Takeaways**

We expect that others may be interested to learn about how NB can be used to learn student affect to inform instruction and how we are using these data to train automated classifiers that may one day help to streamline the automated acquisition of similar information from student commenting.

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## Library Pedagogies to Support Student Research

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### Purpose

This Institutional Review Board (IRB)-approved project tested the value of three pedagogies in library instruction sessions in a First Year Seminar (FYS) to further develop student research skills.

1. Extensive reading lists. Our intention was to provide a road map for research, omitting time-consuming floundering at the outset, and translating the students' critical engagement to a higher level.
2. Concept maps. These were used to help the students reflect on the research process and to enable the instructor assess their understanding of it.
3. Expanded library session. The library instruction for this FYS departed from the usual focus on database use to address other aspects of the research process including critical source evaluation and integration of sources into the research paper with a variety of methods.

### Main Findings

We found that quality of sources found by the students was higher than the generally low-level reflected in studies on this subject and was independent of the availability of reading lists. The concept maps, used with specific methodology, showed progress in understanding the research process. The integration of sources raised a number of questions suggesting that a more systematic assessment tool is an important next step in understanding how students use sources. The study offers suggestions on developing such a tool.

### Description

Three pedagogies were studied during iterations of an FYS on War and Peace during the academic year 2016-2017: (1) Reading lists of recommended sources (2) Repeated iterations of concept maps (3) Library instruction on evaluating sources and integrating them into a written argument. The impact of these three pedagogies was measured through a study of student work in the form of homework assignments and research papers. The data for each class was examined individually and also aggregated together.

### Relevance and Takeaways

Our ultimate aim is to develop better insights into how students learn to become credible researchers able to gather and evaluate information on their own. A clearer understanding of their learning process will also likely help guide both librarians and instructors in their efforts to teach how to do research.

### Author Biographies

Dr. Linn Normand obtained her BA in Social and Political Sciences from the University of Cambridge, UK, and her PhD in International Relations from the University of Oxford, UK. Dr. Normand was a Herchel Smith Scholar at Harvard University, and a Graduate Research Fellow at the Program on Negotiation at Harvard Law School. She was affiliated with the University of California, Davis as a writing specialist at the Student Academic Success Center (SASC) and is an instructor for the first year research seminar on "Waging war, Waging peace". She was a member of the CEE's first Faculty Learning Community in 2016. She is also the author of *Demonization in International Politics: a Barrier to Peace in the Israeli-Palestinian Conflict*, New York: Palgrave Macmillan (July, 2016).

Matt Conner has an A.B. in English from Princeton University and an M.A. and Ph.D. in English as well as an M.L.S. from the University of Illinois at Urbana-Champaign. He is a research librarian at the Carlson Health Sciences Library. He is author of *The New University Library: 4 Case Studies*, Chicago: ALA (April 2014) and is former president of the Librarians Association of the University of California (LAUC).

## Understanding Barriers to Success for Engineering Transfer Students at UC Davis

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### Purpose

The University of California has the largest proportion of low-income undergraduates among the nation's research universities. One important pathway for low-income students is matriculation from the California Community Colleges. Transfer students at UCD often report difficulties in their transition from their community college to the university. Students transfer to UCD traditionally at the beginning of the junior year, taking full course-loads of classes on a quarter system. To succeed, these students must adjust quickly to the new schedule and expectations, while also trying to build a new community of peers. We conducted focus groups and analyzed survey data to understand the barriers to the success of transfer students in the College of Engineering at UCD.

### Main Findings

The following themes emerged from our research:

1. There is a change from a "pro-learning" environment to a "grade-crazy" environment, where it is no longer clear how effort correlates to grades at UCD.
2. A lack of physical space for collaborations is noted by transfer students.
3. The overall academic preparation of most engineering transfer students is strong, with the exception of certain topics (MATLAB).
4. Building "social capital" is vital to a successful academic transition.
5. The relationship between students and instructors is different at the community college as compared to UCD.
6. Department academic advisors at UCD in the College of Engineering are very helpful for students staying on track for graduation.

### Description

We conducted a research study to collect information on the experiences of transfer students. This consisted of student survey data and focus groups with transfer students. The survey data was a subset of questions from the University of California Undergraduate Experience Survey (UCUES), comparing the results of transfer and non-transfer students. Additionally, results were separated to see if there was a significant difference in the responses of transfer students who are low income and/or underrepresented minorities as compared to their transfer student peers. The three subsequent focus groups with transfer students allowed for a more comprehensive view of COE transfer student experiences. Six themes were identified through the study (described above).

Two targeted interventions are planned for Fall 2017 to aid transitions for incoming transfer students. A MATLAB workshop will be offered in Fall 2017 to help students who are unprepared for MATLAB programming in their engineering courses. The second intervention is an Aggie Connection group that is offered for students transferring into the Civil and Environmental Engineering department. The Aggie Connection will support students as they develop social connections within their major, as the study indicated social capital is important to their academic success.

### Relevance and Takeaways

Transfer students compose a significant portion of the UC Davis student population. For example, the entering class of Fall 2016 was composed of 3,632 new transfer students, and 5,764 new freshmen. As faculty and administrators work to help these students, it is important that we understand their experiences rather than relying on anecdotes and faculty perspectives. We want the audience to consider how the experiences and perspectives of the transfer students can shape their classes and the university. For example, we hope to stimulate further discussions about progressing towards an environment where students value learning as much or more than grades, such as they felt at their community colleges.



### **Author Biographies**

Susan P. Gentry is a Lecturer with Potential Security of Employment in the Materials Science and Engineering department at the University of California, Davis. In her current position at UC Davis, she is integrating computational modules into the undergraduate and graduate materials curriculum. She is specifically interested in students' computational literacy and life-long learning of computational materials science tools. In addition to her course improvements, she is also working on improving the experiences for transfer students at UC Davis.

Colleen E. Bronner is a faculty member in the Department of Civil and Environmental Engineering at UC Davis. She has a Ph.D. and B.S. in Environmental Engineering from the University at Buffalo, and a M.S. in Civil Engineering from the UC Berkeley. Her current scholarly interests include integration of engineering into pre-college education, increasing inclusivity in engineering, developing the professional skills of engineering students, and sustainable and bio-inspired civil engineering design. She especially enjoys serving as faculty advisor to the UC Davis Engineers Without Borders chapter and participating in the American Society Engineering Education's LGBTQ Equality Virtual Community of Practice.

Jennifer Choi is a faculty member in the Department of Biomedical Engineering at UC Davis. She received her Ph.D. in Biomedical Engineering from Tufts University, M.S. from Syracuse University, and B.S. from Cornell University. She is actively engaged in the integration of engineering design principles throughout the undergraduate program through team-based design experiences. Her scholarly interests include evaluating the impact of curricular activities on design thinking skills and student learning, understanding STEM problem solving across disciplines, and improving the transfer student experience.

Jason R. White is a faculty member in the Department of Chemical Engineering. He has been at UC Davis since 2015 and has instructed three senior-level design courses: Plant Design and Economics, Unit Operations and Separations, and Plant Design Project. He has also instructed two senior-level biochemical engineering courses (Bioseparations and Bioprocess Engineering Laboratory) as well as the Mathematical Methods for Chemical Engineers course. His research background is in computational systems biology and he is currently interested in improving the freshman and transfer-student experience.

Implementation of Course-Based Undergraduate Experiences (CUREs) at R1 University through the First-Year Seminar Program; preliminary investigation of impact and challenges associated with this course format.

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### **Purpose**

The 2017 NAS report on Undergraduate Research Experiences (UREs) concluded that participation in research is beneficial for students and increases STEM persistence. However, access to UREs is often inequitable, and the available, traditional faculty-mentored research opportunities underserve students with disadvantaged backgrounds (i.e. URM, low income). Course-based Undergraduate Research Experiences (CUREs) provide a scalable solution to increase research access to a larger and more diverse body of students than are being met by traditional UREs. The UC Davis First-Year Seminar (FYS) Program hosted a pilot series of CUREs in 2016-2017. The First-Year Seminar structure is a both unique and highly adaptable model for R1 institutions' CURE offerings thus facilitating widespread scalability. Here, we aim to describe the implementation Course-based Undergraduate Research Experiences (CUREs) offered at UC Davis and their initial impact on transfer and freshman students.

### **Main Findings**

UC Davis has developed a series of primarily biology oriented, research-based courses through the First-Year Seminar Program. In the 2016-2017 academic year, 118 students participated in one of more of eight classes. An average of sixteen students enrolled in each offering. We used surveys and student reflections to evaluate changes in student attitudes in association with these CUREs. Data collected from this pilot suggests significant CURE-associated gains in student's scientific identity and self-efficacy, which are traits linked to retention. We plan to continue tracking the students to assess long-term effects.

### **Description**

The intent of this presentation is to provide (1) brief but sufficient background on CUREs to give context to their development here at Davis, (2) an explanation of the challenges and opportunities associated with offering this type of course in First-Year Seminars (3) course-associated changes in student attitudes, (4) ideas for future iterations of existing classes, programmatic expansion, and future studies on student learning. To accomplish effective delivery of this content we will employ the following: student produced video clip of CUREs, graphical representation summarizing student responses to attitudinal surveys, a brief open-ended active learning activity to foster group discussion of content, follow up online distribution of FYS-CURE resources to SOTL attendees.

### **Relevance and Takeaways**

Data from previous, large-scale studies show that CUREs significantly improve long-term student retention in STEM majors for students of all backgrounds and CUREs have the potential to make research experiences more accessible to larger numbers and more diverse groups of students. The FYS-CURE initiative serves as a venue for faculty at UC Davis to connect their research and teaching in a learner-centered environment. The results of this study suggest students benefit from CUREs in the first year seminar context and this data contributes to the growing body of research supporting the effectiveness of CUREs as a high-impact practice.

### **Author Biographies**

Ashley serves as a Curriculum Planner for the UC Davis First-Year Seminar Program. Ashley's primary project is to develop a series of experiential learning seminars in which students produce work that targets issues relevant to the faculty instructor's discipline. Ashley is interested in how these experiences impact students' motivation and career trajectories.

## Rasch Modeling in Undergraduate Foreign Language Test Design: A Study on Reliability and Equating

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### **Purpose**

The goal of this project was to create high-reliability parallel forms of the exams used in SPA 1 at UC Davis. Research began with a preliminary review of the exams used in the department during Fall quarter of 2015, which showed numerous problems with the reliability and validity of the exams. Based on these preliminary findings, two research questions were developed: 1) Can Item Response Theory (IRT) identify which items and content areas provide the most information about the population of interest? 2) If such items and content areas are found, can they be used to construct parallel forms.

### **Main Findings**

By evaluating multiple content areas on the same exam, the IRT model identified the specific content area (article-noun agreement) that best evaluates student ability level at the time of the exam. This content area is deemed the most appropriate for two reasons: 1) it has items that match the broadest spread of ability levels of any content area included on the test, and 2) the items that most closely match the mean ability level of the population are all from this content area, such that it provides meaningful differentiation for the highest possible number of students in the course.

### **Description**

The study uses Rasch modeling (a type of IRT model) to evaluate the difficulty and reliability of items on the three exams used in the first-semester Spanish course at UC Davis. Because the results are discipline specific, the presentation will focus on how data collection was designed and implemented to maximize the relevance for attendees from other disciplines. This will include a description of the internal common item, nonequivalent group equating design that was used. This technique allowed a 30% increase in the size of the collected item bank. The presentation will also cover the method used to create parallel forms from the internally developed item bank, which helps protect the integrity of the exam and will allow for the creation of other, albeit similar, forms should the need arise. Finally, the presentation will conclude with a discussion of automating data collection by recording answers to quiz questions placed on Canvas, which will drastically reduce the cost of similar research in the future.

### **Relevance and Takeaways**

This study shows how to apply IRT to data collected from in-class exams to develop high-reliability tests in-house. While the results are specific to the Department of Spanish and Portuguese, the methodology could be applied in other departments. In this light, the discussion of automating data collection via the Canvas component of hybrid classes, which will greatly reduce the cost of future research, will be particularly relevant. The audience is expected to leave with an understanding of the conceptual steps necessary to apply the methodology in their own departments.

### **Author Biographies**

Glen Heinrich-Wallace studies Second Language Acquisition and Language Assessment at UC Davis. His primary research interests are improving the reliability of early-stage language evaluation through the use of Item Response Theory and other statistical models, and including vocabulary as a principled element of language assessment.

## Peer-to-Peer Tutoring for Literacy Development in Multilingual Student Settings: A Qualitative Look at Student Literacy Practices

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### **Purpose**

Research in Bi/Multilingual teaching contexts has been framed around the conception of bi/multilingualism as a linguistic practice stemming from separate, or bounded ‘codes’ or ‘systems’ which are often assessed in isolation from the other. This disciplinary framework, I argue, has contributed to monoglossic perspectives in bi/multilingual teaching settings, disregarding the innovative language practices of bi/multilingual students. This project explores the literacy practices of a group of bilingual undergraduate students who are speakers of Spanish as a Heritage Language and who work as academic tutors to other bilingual students enrolled in Spanish university courses. It does so by adopting a social approach to bi/multilingualism, which considers language production as a social and cultural practice; that is, bound not to our inherent linguistic skill but to our social practices as participants in particular communities. By studying the innovative ways in which bi/multilingual students contribute to other students’ academic experience, I argue that peer-to-peer tutoring is a valuable academic tool in bi/multilingual teaching contexts, and especially in higher education.

### **Main Findings**

Qualitatively-driven linguistic analysis of more than 30 hours of video recording of tutoring sessions, interviews and field notes shows that peer tutors within the context of Spanish Heritage Language Development deploy innovative interpersonal practices that contribute to students’ positive interaction with academic tasks (namely, contributing to the academic development of the student, creating a space where students are able to portray themselves as active agents in their own learning, openly presenting themselves as academic resources, among other findings). The hybrid literacy practices that bilingual peer tutors deploy during the session mediate both the academic task and the tutee’s active participation in it, which may not always happen in the traditional classroom.

### **Description**

By reframing a deep-seated theoretical perspective that views bi/multilingual language development as the reflection of an individual’s performance in one language in isolation from the other(s), and instead framing language production as the reflection of particular social and cultural practices, this study seeks to shed light on the linguistic resources that bi/multilingual university peer-tutors deploy in order to contribute to the academic well-being of other bi/multilingual peers in a higher education context. Tutoring sessions between tutor and tutee (both speakers of Spanish as a Heritage Language) are qualitatively analyzed to understand thematic patterns showing tutors’ contributions to both the academic and language development of their tutees. Tutoring sessions are mandatory and co-occur with a traditional course for all students enrolled in SPA 31-33 (Spanish for Native Speakers) offered through the Department of Spanish & Portuguese. Tutors and tutees meet in an academic space outside of the classroom, where they have full autonomy to mediate the academic task as they deem most appropriate. This academic autonomy allows tutors to deploy untraditional—yet innovative—language and literacy practices which are not available (or contextually appropriate) in the classroom, including the use of code-switching and language characteristics of informal varieties of Spanish (spoken by the great majority of both tutors and tutees). I argue that this type of non-traditional academic space allows bi/multilingual students to take on the roles of experts, contributing significantly not only to the academic trajectory of their peers, but also to their own.

### **Relevance and Takeaways**

Speakers of Spanish as a Heritage Language are an important part of our community’s linguistically diverse student body at UC Davis. Many of them are first generation students looking to find academic contexts that mirror their previous academic (and linguistic) experiences. By sharing the work that peer tutors do within the Program for Native Speakers at the Department of Spanish & Portuguese, my intention is to showcase one of such academic contexts where bi/multilingual students themselves take an active role in their own as well as their

peer's academic endeavors through the use of untraditional—yet innovative—linguistic and literacy practices. The significant contribution of this student group can have implications for the development of similar peer-to-peer programs across disciplines, with the main goal of serving similar linguistically diverse student communities.

**Author Biographies**

Lina Reznicek-Parrado is a PhD Candidate in Spanish Linguistics. She has taught a variety of Spanish courses at UC Davis, including writing composition, Spanish for Heritage Speakers and Spanish in the U.S.. Along with working as a TAC within CEE as well as a Graduate Writing Fellow at the University Writing Program, she has also taught courses in the School of Education and has worked with pre-service teachers undergoing training to work with bilingual communities. Her main interests are related to the pedagogy and literacy development of Spanish for bilingual/heritage speakers, and the sociolinguistic and educational implications of Spanish as a U.S. language.

## Supplemental Instruction in a high-enrollment upper-division biology course improves student learning and success

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### **Purpose**

National calls to increase the success and retention of underrepresented students in STEM have resulted in many efforts that implement effective and inclusive practices in introductory courses. However, there remains a deficit in evaluation and implementation of effective educational practices at the upper-division level. Upper-division courses not only present more challenging disciplinary content but are distinctively the courses transfer students encounter at a critical time when navigating the transition from community college to the 4-year university. The purpose of this study was to characterize whether supplemental instruction is an effective practice for promoting student success at the upper-division level.

### **Main Findings**

66% of students in a large upper-division genetics course (n=818) participated in optional supplemental instruction (SI). SI students earned higher overall course grades compared to non-SI students (SI = 2.89 GPA, non-SI= 2.58 GPA;  $p < 0.0001$ ). SI first-generation, underrepresented minority, and transfer students earned higher overall course grades compared to non-SI peers, with the largest difference observed for first-generation students (0.44 GPA difference,  $p < 0.01$ ). SI students performed better on learning outcomes explicitly reviewed in SI compared to non-SI students on summative assessments. However, no significant difference was observed between SI and non-SI student performance on learning outcomes not explicitly reviewed in SI.

### **Description**

Data was collected over three academic quarters (Winter 2016, Spring 2016, and Winter 2017) to characterize participation outcomes of a baseline supplemental instruction (SI) model in a high-enrollment upper-division genetics course. Each lecture section was enrolled by 270-300 students, composed of 30-35% transfer students, 22% underrepresented minorities (URM), and 19% first-generation students. Students who enroll in SI received 1-unit of credit for completing weekly problem-sets and attending 50-minute weekly discussions led by a graduate student teaching assistant. Surveys were administered in the first and last week of the quarter to characterize demographics of student participation, reasons why students opt to or not to participate in SI, and the perceived value of SI on student learning. To determine whether participation in SI positively correlates with overall student success and learning, final course grades and performance on individual summative assessment items were analyzed comparing the performance of SI to non-SI students as well as comparing outcomes between SI and non-SI students based on URM, first-generation, or transfer student status.

### **Relevance and Takeaways**

This study provides evidence that suggests supplemental instruction is an effective educational intervention for promoting student learning and success in a large upper-division course. SI may be an ideal candidate intervention for wider-implementation in other large upper-division courses to promote student learning and success at the upper-division level, with the potential to have a profound impact on incoming transfer students new to the large 4-year university culture. This study provides a baseline for future work to implement more evidence-based learner-centered structures into SI, such as peer-led team learning, to promote student learning and success.

### **Author Biographies**

Dr. Marina Crowder is Teaching Faculty in the Molecular and Cellular Biology Department. In addition to teaching majors and non-majors undergraduate courses in genetics, she is interested in structures to better support the learning and success of transfer students and other underserved students in the upper-division curriculum. She is also interested in graduate student teaching professional development. Prior to joining UC Davis, Marina taught at

Laney Community College and was a postdoctoral fellow at UC Berkeley. She received her doctoral degree in Biochemistry, Molecular, Cellular and Developmental Biology and B.S. degree in Genetics, both from UC Davis.

## Comparing traditional and flipped class outcomes

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### **Purpose**

An upper-level science course was offered using a traditional format and then offered 2 years later in a flipped format. Everything was kept the same to the extent possible, except the flip (i.e., lectures were delivered by video podcast and class time was used for working problem sets). The purpose was to find out how performance would compare using traditional metrics

### **Main Findings**

Performance of best and worst students in traditional metrics was no different between traditional and flipped formats; these groups do not respond to delivery format alone. The large middle group of students improved understanding and skills, but when exams only query lecture materials, then performance does not change much—a video is equally as effective or ineffective as an in-person lecture. The conclusion is that the vast efficiency of switching to flipped delivery does not cause any degradation of student performance on traditional metrics. Advancements are needed to gain new metrics that test student performance on in-class collaborative activities.

### **Description**

Performed a head-to-head test of student outcomes with traditional versus flipped format with the same course content and testing materials. Analyzed results to assess effects.

### **Relevance and Takeaways**

Flipping a class takes time upfront, but offers vast efficiency and improved experiences for faculty and students. This study found no harm in flip when measured using traditional metrics. The benefit to faculty is that instead of wasting time refreshing lectures annually, they can instead put time and effort into being professional teachers focused on guiding students in their individualized learning needs. It is difficult to quantify student progress by non-traditional means, but professional judgement can indicate how students are coming along, and the flipped class offers far superior faculty-student engagement.

### **Author Biographies**

Professor with 18 years experience at UC Davis, including always seeking to improve performance as a scholar



## Impact of two-stage quizzes on student learning gains and perceptions

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### **Purpose**

Two-stage exams, a feature of the Team-Based Learning approach, are composed of an individual component, followed immediately by a collaborative component of the same exam. When administered in a class that emphasizes active learning, this assessment technique has been shown to be an effective and complimentary method to assess students' understanding of course content. The purpose of this study is to gain understanding of the impact of 2-stage quizzes on student academic performance and student perceptions in a lower division biomedical engineering course. We hypothesized that the use of 2-stage quizzes, a collaborative learning tool, will improve student quiz scores in comparison to individual quiz scores and improve overall course performance.

### **Main Findings**

Survey responses and corresponding course performance grades (individual quiz, collaborative quiz, midterm, and final exam grades) were de-identified for all students who opted to participate in this research study. Survey responses indicate reported value of 2-stage quizzes, positive impact on motivation to complete textbook reading, enhanced conceptual understanding of course content and preference of 2-stage quizzes over individual quizzes. Student performance on the collaborative quiz components was higher than on the corresponding individual components for at least half of the participants. While some positive impact on exam and final course grades was evident, further controlled studies need to be performed to confirm statistical significance.

### **Description**

Fundamentals of Bioengineering is a required 2nd year Biomedical Engineering course aimed to address fundamental bioengineering concepts through the application of conservation principles to biomedical engineering problems. This course serves as a prerequisite course for the upper division courses in which subsequent courses rely on students' content knowledge from this course. We are therefore continually improving methods to make content more accessible from a learning perspective and enhance conceptual understanding, and as a result, improve overall student performance in the class. One new assessment method that has been implemented is weekly 2-stage concept quizzes based on assigned textbook reading. Each 2-stage quiz has both an individual and collaborative component, allowing students to use discussion and collaboration as a means to improve conceptual understanding of a particular concept. To assess the impact, a survey administered at the end of the course asked students to provide feedback regarding: (A) Experience taking 2-stage quizzes (students anecdotally have stated that this was their first time engaging in this type of assessment); (B) Level of influence on motivation to complete textbook reading; (C) Effectiveness as a preparatory tool for exams; and (D) Students' perceptions on level of conceptual understanding. A comparison of overall course performance was also made to overall course grades in the previous year, in which 2-stage quizzes were not implemented (but same instructor).

### **Relevance and Takeaways**

The incorporation of 2-stage quizzes as an active tool for assessment demonstrated positive impact on student performance, conceptual understanding, and motivation to complete textbook reading. While future controlled studies to eliminate the effect of repeated test taking will be performed, the findings from this study demonstrate feasibility and benefit of an active team-based assessment technique.

### **Author Biographies**

Jennifer Choi is a faculty member in the Department of Biomedical Engineering at UC Davis. She received her Ph.D. in Biomedical Engineering from Tufts University, M.S. from Syracuse University, and B.S. from Cornell University. She is actively engaged in the integration of engineering design principles throughout the undergraduate program through team-based design experiences. Her scholarly interests include evaluating the

impact of curricular activities on design thinking skills and student learning, understanding STEM problem solving across disciplines, and improving the transfer student experience.

## Outcomes of Sophomore Organic Chemistry Immersion Program

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### **Purpose**

Study of student performance in a traditionally very challenging course sequence (CHE 128 series) under conditions of immersion in a small group setting ( $\leq 20$  students), made possible by a UC Davis Study Abroad offering.

### **Main Findings**

Despite the personal stresses involved in studying abroad, significant improvements in student performance were seen using the immersion method, with little evidence of student "burnout." Factors contributing to this improvement are proposed to be: 1) continuity of learning the course material over 3 months from one or two faculty as opposed to 9 months from as many as three, 2) lack of distractions from courses in other subjects, 3) greater involvement of the faculty teaching the course, 4) smaller class sizes, and 5) supportive group dynamics.

### **Description**

Sophomore organic chemistry (CHE 118 or 128 series at UCD) presents a well-recognized obstacle between students and a chemistry degree, professional school (pre-medical, pre-dental, pre-veterinarian), and majors in related disciplines (chemical engineering, agriculture, etc). Generally conducted across three consecutive academic quarters (on-sequence) or more (off-sequence), student performance typically follows a Gaussian curve skewed with a "B-D shift" (normal distributions of A, C, and F grades, lower distributions of B grades, higher distributions of D grades). Students and faculty were presented the opportunity to conduct the CHE 128 series in immersion mode during the fall quarters of 2015 and 2016 in the form of a study abroad program at the University of Nottingham in the United Kingdom. In place of the standard 150 minutes of lecture per week, students were subjected to 480 minutes of lecture per week in addition to a laboratory course that involved both lectures and lab (129A), plus a Chemistry and Culture course taught by local faculty.

### **Relevance and Takeaways**

The positive outcomes realized using immersion in sophomore organic chemistry suggests this approach may be of value outside the context of the Study Abroad program. An on-campus offering of this nature would be unique among the UCs.

### **Author Biographies**

Mark Mascall did his PhD at Imperial College in the University of London and postdoctoral research with Nobel Laureate Jean-Marie Lehn in Strasbourg, France. He is a faculty member in the Department of Chemistry and his research centers around applications of organic synthesis to renewable energy and materials, conducting polymers, pharmacology, and fundamental aspects of molecular structure. He has a keen interest in chemical education and has published in this area. He also is an advocate of study abroad experiences in the sciences and developed a program in this area that was initiated in 2015.

## What issues do students draw upon when they reason about biotechnology?

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### **Purpose**

Biotechnology is a complex socio-scientific issue. Because societal decisions about biotechnology involve more than just facts – other features include morals, ethics, economics, and policy – it is important to develop classroom assessment tools that accommodate the many facets of biotechnology literacy. We sought to characterize student reasoning about biotechnology using a "bottom up" (or data-driven) approach. By doing so, we can empirically identify the issues that resonate with students.

### **Main Findings**

In this study, we took a qualitative approach to characterize how undergraduate students reason about biotechnology in a course designed for non-science majors. We identified a set of seven overarching themes that are prominent in student reasoning about biotechnology. These themes are: Progress, Economic, Morality/Ethics, Middle Way, Scientific Validity, Equivalence, and Generic Risks or Benefits. Five of these themes have been previously described in studies of mass media communication of biotechnology. Our preliminary analysis suggests that peer-led discourse can promote changes in student understanding of biotechnology.

### **Description**

Summary of Methods:

Using the written justifications given by students in Genetics and Society (SAS20, FQ15) for their attitudes on four biotechnology topics – GMO labeling, GE of animals, DNA fingerprinting and human embryo editing – we performed a qualitative approach known as hybrid thematic analysis. This technique identifies overarching patterns or themes that are prevalent in students' reasoning about biotechnology. The process began with a literature review to develop an a priori template using themes described in related studies. Through an iterative process, we identified seven major themes that students drew upon in their justifications. We also tallied the number of times we detected a change in the use of a theme following a given discussion section (i.e., whenever a student adopted new reasoning or abandoned prior reasoning following a discussion section).

### **Relevance and Takeaways**

The applications and implications of biotechnology are expanding, due in part to the gene editing revolution. Despite efforts to increase teaching of biotechnology worldwide, there are concerns that public literacy of genetic technologies remains insufficient. The themes described here can be used in future assessments of biotechnology teaching and learning. In particular, they can help educators track the components of biotechnology literacy that may be independent of students' explicit genetics knowledge.

### **Author Biographies**

Brittany Anderton was a UC Davis Chancellor's Postdoctoral Fellow in Pamela Ronald's lab from 2015-2017. She is currently a postdoctoral scholar with Natalia Caporale in the department of Neurobiology, Physiology and Behavior at UC Davis and a lecturer in the Biology department at CSU Sacramento. Pamela Ronald is Distinguished Professor of Plant Pathology and the Genome Center. Her lab primarily studies the genetics of rice, an important staple crop.

## Hybrid vs Traditional: Student Performance Differences in an Economic Development Course

Janine Wilson, Derek Stimmel and Sattik Ghosh

Economics

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### **Purpose**

We study how a hybrid course structure impacts student learning relative to a fully face-to-face course in economic development.

### **Main Findings**

Our findings suggest that while the overall results are mixed there are clear benefits and costs for different segments of the enrolled students. In particular, students for whom English is a second language seem to see some benefit from the hybrid course format while underrepresented minorities seem to face higher costs resulting in worse overall performance. The latter appears to be driven by poor early performance in the hybrid course, which may suggest the relatively unfamiliar course format may present an initial fixed cost or barrier for student learning. We also see some evidence that traditionally poor performers do benefit from the hybrid course format

### **Description**

We use ordinary least squares (OLS) specifications to analyze student demographic and admissions data obtained from the University of California at Davis (UC Davis) and the campus Center for Educational Effectiveness database in conjunction with course grade data collected and compiled by the course instructor. Course grade data includes raw scores for every assignment, midterm, and final for each student. Student demographic data includes gender, underrepresented minority (URM) status, English language proficiency status, international status, admission level (i.e. freshman vs. transfer), and first generation student status. The dataset also includes information on students' incoming SAT scores, major and overall GPA at the time of taking the economic development course.

Course data includes information from 10 quarters of the traditional economic development course, offered between Winter 2009 and Winter 2015, and 2 quarters of the new hybrid version offered in Winter 2016 and Winter 2017. In total, 1,359 students took the traditional course and 258 students took the hybrid course between these times.

### **Relevance and Takeaways**

Our paper offers UC Davis instructors considering experimentation with a hybrid format an opportunity to see the impact of our course redesign on the learning outcomes of our students. In a world where many instructors are experimenting with new technology in their courses, measuring the impact on student learning outcomes is extremely important. We would like to know if we are negatively impacting some students while improving the learning outcomes of others.

### **Author Biographies**

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## Attempting a “casual” writing assignment in a large upper division biochemistry lecture course: goals, barriers, and student perception

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### **Purpose**

I incorporated a writing assignment into a large, upper division biochemistry lecture course. Students chose their topics, connecting in class material to an area of interest outside of class. My goals for the assignment were to increase student engagement, facilitate the discovery that biochemistry is everywhere and relevant, and provide students the opportunity to explain scientific topics in their own words. The writing assignment was intended to be "casual" in that students were asked to write for their peers, the length of the assignment was short, and the assignment was not a large part of the overall course grade. I surveyed the students after each quarter of the writing assignment to assess their perceptions of writing and of the assignment. I also surveyed a class in which no writing assignment was assigned to gauge their perceptions of writing in this type of course.

### **Main Findings**

Students appreciated the opportunity to write in this course after having done the assignment, despite the reluctance reported by the class that had no writing assignment. Large class sizes of up to 400 pose a challenge for grading, so I used an online peer grading system (Peerceptive). I discovered that students focused on the peer review aspect of the assignment, rather than on the writing. Students were not satisfied with the peer review process, as predicted by the no-writing class. However, unlike the perceptions predicted by the non-writing class, students reported that they enjoyed reading each other's writing. Data showed that any time spent in class to explain the assignment increased student satisfaction, even if the time was spent merely reading instructions that were posted online.

### **Description**

I collected surveys from students at the end of the quarter from three classes: two classes had writing assignments and one class did not. I implemented some changes between the two quarters which had the writing assignments.

### **Relevance and Takeaways**

We want our students to achieve scientific literacy and this can be facilitated by asking students to communicate scientific topics in their own words. Writing in a large, non-lab upper division science class is not common, but identifying barriers, goals, and positive outcomes can help make writing a more seamless part of an upper division science course. I discovered that my goals for the assignment were not aligned with the way the assignment was graded, so that a "casual" assignment was perceived as stressful.

### **Author Biographies**

Mona Monfared is a Lecturer PSOE in the Molecular and Cellular Biology Dept. She teaches BIS102: Structure and Function of Biomolecules and BIS103: Bioenergetics and Metabolism. She received her PhD in Biochemistry and Molecular Biology at UC Davis and did postdoctoral research at the Plant Gene Expression Center at UC Berkeley/USDA. She has been a faculty member of Santa Clara University, St. Mary's College, Holy Names College, and UC Berkeley Extension.

The impact of Cornell Note Taking (CNT) on student performance and engagement in a large enrollment undergraduate classroom  
(WORK IN PROGRESS)

Bwalya Lungu

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### **Purpose**

Note-taking in lectures is often seen as the distinguishing characteristic of learning. Previous studies suggest that note taking is a skill students must learn to facilitate learning. Typically, instructors assume this is a skill students have or will learn on their own. Student evaluations suggest that one of the most common challenges students face is effective note taking during lecture while trying to assimilate and understand lecture material in a large classroom setting. Therefore, in this study, we investigated the use of Cornell Note Taking in a large enrollment undergraduate classroom and assessed its impact on student learning and performance.

### **Main Findings**

This study began in the Spring of 2017 and will conclude in the Spring of 2019.

We want to explore whether CNT: 1) would improve student learning and 2) would impact student attitudes/perspectives of course material.

We wanted to determine whether a structured note taking system would improve student note taking skills over the quarter.

In addition, we wanted to determine whether note taking skills and student learning are affected by other factors (listed below) in a student's background.

- ELL
- Education background (International, 1st Generation)
- -High School Educational background/preparation (LCFF)
- -Transfer Student status

### **Description**

We will investigate the use and impact of Cornell Note Taking (CNT) on student learning in large enrollment undergraduate classrooms. Specifically, the study will:

- 1) assess how CNT impacts student performance on midterm exams,
- 2) assess whether CNT will improve learning in students from various educational backgrounds.
- 3) evaluate how high, low and medium performing students are utilizing CNTs
- 4) determine whether the Cornell Note Taking system will enable the low and medium performing students to improve their performance over time.

The following methods will be used to assess student performance

- Landscape analysis to determine student target groups, student performance
- Midterm exams and final overall grade
- Survey data: Pre and post quarter surveys
- University evaluations
- Cornell Notes evaluation: CNT feedback and Sample notes from high, middle and low performing students will be assessed

Overall, this study will be used to gather information: 1) on how CNT's can be used to enable active/participatory learning in large enrollment classes, 2) that will provide insight into practices that can be utilized to improve student learning in large classes and 3) to determine which factors in a student's background may present as a barrier to student learning.

**Relevance and Takeaways**

Increased enrollment places a significant burden on resources and infrastructure thus posing significant teaching challenges. For instance, large classes offer less opportunities for students to interact directly with instructors/content expert. Large classes are diverse thus the difficulty level increases for some students impacting overall learning. Therefore, the instructor needs to develop strategies to overcome barriers to learning. We need to develop research based tools and methods to improve student learning/engagement in high-enrollment classes. We also need to understand which practices are valued by students and how they impact student attitudes and perspectives of both the course material and overall learning.

**Author Biographies**

Dr. Bwalya Lungu is a faculty member of the Department of Food Science and Technology at UC Davis. Dr. Lungu has a background in microbiology and food safety. She currently teaches undergraduate classes in food science. Her experience includes a solid combination of academia, research and industry. Her goal is to educate the next generation of food scientists and supply them with the tools and skills needed to provide “real world” solutions for the evolving food industry. Her teaching style combines the use of technology with traditional methods to connect with a diverse student population creating an engaging learning experience.



## Thinking critically with our first- and continuing-generation students (WORK IN PROGRESS)

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### **Purpose**

Critical thinking (CT) skills are of paramount importance to earning a degree in psychology. They are skills that we emphasize in our lower division research methods course and then practice throughout the curriculum.

UC Davis serves a diverse student body.

What factors predict differences in critical thinking skills?

What instructional innovations ensure that all students do their best?

### **Main Findings**

There are many characteristics of students that predict initial performance on critical thinking tasks (e.g., parental education, English as a second language, ethnicity). Through instructional interventions such as additional examples and guided activities, the achievement gaps close rapidly across the quarter.

### **Description**

Students were given written and multiple-choice critical thinking assessments at the beginning of a lower-division research methods class. Students written exam performance was tracked across the quarter. Students completed the same multiple-choice assessment at the end of the quarter.

Demographic information was gathered directly from the students and from their official records.

Instructional interventions: video based additional examples

### **Relevance and Takeaways**

Understanding the diverse preparation and prior experiences of our students will help us all work toward our shared instructional mission. Critical thinking skills are an indicator of the broad skills and abilities needed to succeed in university education. Understanding achievement gaps is a first step to ensuring that every student achieves up to their potential or educational goals.

### **Author Biographies**

Victoria has been on the UC Davis campus since 1993. She has been a LPSOE in the Psychology Department since 2015. Before that, she taught in Psychology as an Academic Federation lecturer. She was the Assistant Director for Educational Technology at the Teaching Resources Center back when powerpoint was new and exciting.

## Concurrent Classes as an Intervention Strategy in Undergraduate Biology and Chemistry (WORK IN PROGRESS)

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### Purpose

In this study, we test whether or not student performance improves in the biology (BIS 2) and chemistry core (CHE 2) by offering optional concurrent classes (co-classes) to students that attended LCFF high schools. LCFF high schools have high proportions of low income families, English language learners, and foster youth (CDE, 2017). Preliminary analysis of course performance (2014-2016 academic years) shows that LCFF students perform 5% worse on average than matched non-LCFF students in the introductory biology and chemistry series ( $p < 0.05$ ).

### Main Findings

During the 2016- 2017 academic year, 23 co-class sections were offered in the introductory biology and chemistry series. Average recruitment rate across all sections was 17.7% ( $n = 317$ ). Propensity score matching (Ho et al., 2011) was used to assess the individual and combined effects of co-classes on LCFF+ performance using a standard set of control parameters. A combination of pre/post and weekly surveys were used to assess patterns of student behavior and comprehension while providing real time feedback that guided curriculum development. Results of student performance varied by parent course, but combined analysis showed significant gains for LCFF+ students compared to controls in both biology (1.6% higher course totals,  $p < 0.016$ ) and chemistry (4.3% higher course totals,  $p < 0.016$ ). A generalized linear model (glm) was fit to the data to explore the odds ratio associated with LCFF+ pass rate. While odds ratio significance varied by parent course, significantly increased likelihood of passing the parent course was associated with participation in co-classes in most sections. Student reception of co-classes was also favorable, with 89% of students indicating participation as key to their success.

### Description

While similar to recognized supplementary instruction models (Arendale, 1994; 1997), the co-class model is distinguished by the incorporation of a weekly advising component alongside primary content reinforcement. Enrollment in co-class sections was limited to 15 students and each section met three hours per week, with two hours devoted to content reinforcement and one hour focused on advisory support. In contrast to the open enrollment strategy used by most supplementary instruction models, co-class recruitment targeted students who attended LCFF high schools in California.

### Relevance and Takeaways

This work provides information on an intervention model being assessed at UC Davis. We intend to showcase the model and present results with the intent of broadening awareness and participation.

### Author Biographies

Joel Ledford is a Lecturer with Potential Security of Employment in the Plant Biology department at UC Davis. He is working intervention strategies for at risk students that promote self-directed learning and long-term success, specifically in the BIS 2 core. He is also interested in the development of computational resources that promote data driven teaching. Prior to joining UC Davis, he was a postdoctoral fellow at the California Academy of Sciences working on spider phylogenomics and cave biology.

Susan Keen is the Associate Dean for Undergraduate Academic Programs in the College of Biological Sciences. She is interested in the contributions of teaching and advising to the success of "at risk" students in the first year from both freshman and transfer populations. She values a targeted liberal arts program for biology students and is interested in the role of visualization (images, animation, and simulation) for creating meaning in biology.

Joel Ledford, LPSOE, Plant Biology,

Susan Keen, Associate Dean, College of Biological Sciences,

Nicole Sharpe, Academic Coordinator, College of Biological Sciences

## Discussion Tables

The Impact and Implementation of Learning Intervention on Experiential Learning in the University Classroom  
(WORK IN PROGRESS)

Dr. Keisha Nichols  
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### **Purpose**

Resistance to learning is a critical phenomenon that exists in many university classroom settings. There is a dearth of information that has a specific focus on resistance to learning and the affects on transference. Therefore, this research will explore this area more thoroughly to understand if resistance to learning can have a negative impact on learning transfer. The purpose of this exploratory research is to understand this phenomenon within the context of experiential learning. In addition to further understanding, the research will explore a facilitated learning intervention to determine if there is an impact to resistance or a mediated effect on transference of learning.

### **Main Findings**

The conference will allow for an opportunity to engage faculty on their experiences with experiential learning. Questions will be tailored in advance to facilitate a discussion. Questions will focus on the following topics:

- Why students resist learning
- Learning transference
- Learning interventions (techniques, impact)
- Learning and motivation

### **Description**

A methodology of primary and secondary research will be leveraged, inclusive of, but not limited to observations, interviews and the use of psychometric tools to collect data. Two courses have been identified to include in this research. Some of the classes will be designated as control or treatment groups. The classes are inclusive of both undergraduate and graduate courses that are facilitated with experiential learning. The classes will be offered over the course of one academic school year.

The study will conclude with analysis of empirical evidence and proposed pedagogical application and implications.

### **Relevance and Takeaways**

Many institutions, like UC Davis, have a strategic shift to incorporate experiential learning where applicable. The notion of graduating prepared talent that will have immediate impact in the work force is attractive to both students and the industries they will enter after graduation. The institutions that do this best understand the complexities of both pedagogical approach, as well as connectivity to learning assurance goals, creating a synergy for learning transference. It is my intention to engage colleagues in a discourse about their experience with experiential learning, the impact to their respective classrooms and their perspective on relevance to the future of education.

My hope is to offer a continued focus on the knowledge offered in the literature, as well as glean data that will assist in continuing the discourse.

### **Author Biographies**

Dr. Keisha Nichols joined the Graduate School of Management as a lecturer in fall 2015. During her career in academia, Dr. Nichols has taught business management, specifically courses focused in business strategy. With her significant practical industry experience, she has primarily taught graduate studies.

Dr. Nichols brings years of involvement in experiential learning through consulting. She enjoys leading student consulting engagements as they allow educational institutions to strategically engage with the business community, showcase the talent of their MBA students and impact the progress of business.

Prior to her career in academia, Dr. Nichols served in senior leadership for several years at Citigroup Inc. She was a vice president of credit policy in risk management at Citigroup in Atlanta, Ga. In this role she interpreted, wrote and executed credit policy for the Home Depot portfolio. Her role supported Citigroup global and local credit policy in the United States, United States Territory and Canada. She also served as vice president of operations and technology for the Home Depot portfolio in Jacksonville, FL., leading judgmental credit operations in the United States, United States Territory and Canada.

A Davis resident, Dr. Nichols is involved in the Davis and Sacramento communities, specifically engaging the various chambers, the public sector and not-for-profits through consulting, projects and philanthropy. She received her undergraduate degree in business administration, with a concentration in organization management, from Gwynedd Mercy University. She received her MBA, with a concentration in leadership, from Jacksonville University. She received her executive doctorate in business from Georgia State University.

## The Writing Studio (WORK IN PROGRESS)

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### **Purpose**

The Student Academic Success Center (SASC) offers writing services to students that support writing across the disciplines. Our usage data show there are a large number of students who use our services to write better papers. Drawing upon the theoretical and empirical application of “The Writing Studio” by Matthew Kim and Russell Carpenter, we are piloting a writing studio for UC Davis students that encourages long term learning opportunities through a collaborative work group space. Additionally, data analyses indicate a statistically significant impact for students who attend individual writing sessions frequently with our professional staff. However, this service model is costly and can’t be scaled to serve more students. Furthermore, the opportunities to foster better writing habits are not available when students use writing services for quick paper fixes. The question this report asks is the Writing Studio a viable option for increasing efficiency and effectiveness in writing services?

### **Main Findings**

According to the Center for Student Affairs Assessment (CSAA), we know that our individual writing appointment model has a positive impact on cumulative GPA, unit progress, and retention outcomes for Asian and Chicano/Latino students. The Writing Studio model was selected to address a need to serve a larger group of students with fixed resources and costs. A dialogue with conference attendees will address the following questions. What are the needs of faculty related to student writing? How can the Writing Studio partner with faculty? Will the Writing Studio address achievement gaps? Will the Writing Studio be able to address the writing needs from a variety of disciplines at the same level of effectiveness as our individual writing sessions? The first quarter of the pilot will be completed in Fall 2017. By December 1, we will have usage and dosage data to share with attendees. We will submit our data for analysis to CSAA after the first quarter for outcomes

### **Description**

The SASC will discuss the theoretical framework that supports the writing studio pedagogy. Then we will outline how we designed a writing studio to meet the needs of UC Davis students. Evaluations and surveys will be collected to learn about perception of the value of the writing studio for students, writing specialists, and faculty as an academic resource. The qualitative results will be reviewed for common patterns, trends, and themes. The quantitative data will be reviewed for usage, participation, demand, and likelihood of scalability. Specifically, we will determine if there are any changes in usage patterns compared to our other writing services. Based on these results we can determine next steps for the pilot in conjunction with the campus community. Finally, the pilot report will outline a plan for a comprehensive study in partnership with CSAA that will exam impact’s on cumulative GPA, unit progress, and retention for program participation. We aim to evaluate the cost effectiveness of a more scalable writing support model.

### **Relevance and Takeaways**

Anecdotally, faculty members have shared that their students are struggling to meet the writing expectations in the classroom. We are excited to share best practices with faculty and staff in order to create dialogue around the design and delivery of academic support services to address this problem. With the creation of the writing studio we have the opportunity to collaborate with faculty and staff to continue supporting the high expectations for writing at the University. The main goal of this collaboration is to support faculty who want to connect students with writing resources that support the work in the classroom. Ultimately, this has the potential to address the achievement gap around college writing readiness that we know exists at the University.

**Author Biographies**

Carol Hunter is the Director of the Academic Assistance and Tutoring (AAT) unit in the Student Academic Success Center (SASC). Carol works with a team of 21 professional staff and 280 undergraduate tutors to offer math and science, writing, and subject tutoring support services in the department. The AAT provided academic assistance to 7,900 undergraduate students in 2016-17 through courses, workshops, office hours, and drop-in tutoring in over 300 courses.

Dr. Kevin Sitz is the Assistant Director of Writing, Academic Assistance and Tutoring (AAT), in the Student Academic Success Center. Kevin manages the writing services with a team of professional writing specialists to serve students enrolled in writing courses and writing across the disciplines. Annually, Kevin works with hundreds of students through individual writing appointments, provides in-class writing presentations, and provides tutor training for 25 tutors.

## Utilizing undergraduate learning assistants in the lecture or laboratory classroom

Miriam Martin, Geoffrey Benn, and Mary-Betty Stevenson

Microbiology & Molecular Genetics, Department of Plant Biology, and the Mathematics and Science Teaching program

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### **Purpose**

To familiarize educators on the benefits of using undergraduate learning assistants in the classroom and provide participants with the information needed to incorporate this valuable resource into a variety of course formats and sizes.

### **Main Findings**

As university enrollment soars, class sizes increase. The higher student-instructor ratios lead to decreased interaction between the students and instructor, decreased student outcomes, poor student evaluations of the instructor, and increased demands on the instructor.

One readily available resource that can improve the student-educator ratio is the learning assistant (LA). LAs are undergraduates who have previously taken a course and can facilitate discussion among the students in the course. LAs are trained in effective teaching practices and mentored by an instructor as they perform their role.

### **Description**

This round table will inform participants on varied uses and advantages of LAs in different classroom settings. We will also discuss how LAs are trained and the mechanics of setting up a LA program. The discussion panel will include instructors who currently use or train LAs in the classroom and LAs who will share their perspective on the experience.

### **Relevance and Takeaways**

By the end of the round table, participants will be able to describe the advantages of learning assistants and be able to deploy them as a teaching tool in their own classroom.

### **Author Biographies**

Miriam Martin is a Lecturer PSOE in Microbiology and Molecular Genetics. She routinely uses undergraduate learning assistants (LAs) in an upper division laboratory course and is currently exploring role for LAs in a high-enrollment lecture course that emphasizes active learning and peer instruction.

Geoffrey Benn is an Academic Coordinator and Instructor for BIS 2C in the Department of Plant Biology. Among other roles, he recruits, trains, and supervises LAs to assist course TAs with BIS2C labs.

Mary-Betty is a lecturer in the CalTeach/MAST Program. She teaches a pedagogy class for LAs who are currently facilitating discussions in undergraduate biology, math, chemistry, or physics courses.



## Posters

## Design and Initial Assessment of the Impact of Optional Supplemental Instruction Courses in a Large-Enrollment Upper Division Human Physiology Course

Natalia Caporale  
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### **Purpose**

Supplemental instruction (SI) has been successfully implemented across the country to improve student performance in large-enrollment, lower division courses. There is less information available about the usefulness of SI for upper division courses.

### **Main Findings**

Increases in student enrollment over the last few years, has resulted in many upper division courses having significant increases in size, sometimes having up to 600-700 students. In these situations, SI could provide a way to not only support the academic success of the students, but also reduce isolation and increase student-student interaction, by providing students with a small classroom experience.

### **Description**

The poster will present information about:

- The design of the discussion sections.
- The outcomes across 3 quarters: grade effects, student feedback, students perceptions.
- The challenges that remain, particularly in the context of barriers to student enrollment.
- Future work.

### **Relevance and Takeaways**

This is relevant for many reasons:

- Optional supplemental instruction costs nothing to the departments, as the courses pay for themselves with the units of student enrollment and can be extremely helpful to students.
- OSI can be a strategy used to increase the integration of transfer students into the UC Davis community and reduce the academic effects of "transfer shock".

### **Author Biographies**

Natalia Caporale is an LPSOE in the NPB Department. Originally from Argentina, where she did her undergraduate degree in Biological Sciences, Natalia did her PhD in Neuroscience at UC Berkeley and postdoctoral work at UC Berkeley and UCSF. Natalia's research focuses on identifying and breaking down barriers to student engagement and success in STEM disciplines with a focus on minority and non-traditional students.

## Globally Optimizing Public Health Resilience Through Point-of-Care Testing For Infectious Diseases: Implementation For Prevention and Intervention In Central Vietnam

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### **Purpose**

The purpose of the field survey conducted was to analyze diagnostic capabilities and determine needs for infectious disease testing in a Provincial Hospital (PH), District Hospitals (DHs), and Community Health Centers (CHCs) in Central Vietnam, and to recommend healthcare strategies for early intervention and prevention through implementing point-of-care testing (POCT) to enhance public health resilience.

### **Main Findings**

Implementation of POCT elevates public health resilience by allowing patients access to diagnostic tools for suspected infectious diseases. At a national level, the Vietnamese Health Ministry can design policies that prioritize POC tests that obtain large test clusters that provide broader ranges for preventing transmission of highly infectious pathogens and allow early detection of patients located in urban and distant rural areas that attain vulnerable populations at risk of spreading the disease to relatives.

### **Description**

The data collected will be presented in a poster format demonstrating tables and figures of the accessibility to infectious disease diagnostic tests. For example, medical professional respondents (83%, 5/6) demonstrated infectious disease tests unavailable for their community health centers. One community health center had a diagnostic test available for the detection of Malaria (17%, 1/6). All community health centers lacked laboratories equipped with diagnostic tests. District hospitals (50%; 1/2) have diagnostic tests available to test for highly infectious diseases (Hepatitis C, Malaria) and (50%; 1/2) have blood culture and pathogen plate culture. The Provincial hospital has broader diagnostic testing capabilities but lack unmet public health preparedness for highly infectious diseases (Ebola, MERS-CoV, Zika) outbreaks. Demographic analysis showed POCT can speed acute response intervention in rural areas of Thua Thien Hue.

### **Relevance and Takeaways**

UC Davis faculty and educators that attend this conference will learn a great amount of details about the medical infrastructure and problems of Central Vietnam. The medical problems pose interesting questions, they require critical thinking and attendees can learn a recommend implementation that can effect Central Vietnam and have ramifications countrywide. Some medical problems are strikingly similar to the United States, while others have needs unmet.

### **Author Biographies**

Amanullah Zadran, a student research scholar at UC Davis, has a Bachelor of Science in Biochemistry and Molecular Biology, and a Bachelor of Art in Psychology. Amanullah travelled to Central Vietnam to analyze infectious disease testing and ways to implement Point-of-Care Testing (POCT) to enhance public health resilience. He is also actively involved in volunteering as the lead research coordinator at the Newark Wellness Center. Amanullah plans to pursue a Masters in Public Health first before he continues his journey to becoming a physician.

## Scaffolding a MATLAB Assignment to Promote Student Learning

Susan P Gentry

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### Purpose

Incorporating computational activities in the engineering curriculum is vital for students' preparation as "technically agile" members of a modern engineering workforce. However, one significant barrier to implementing discipline-based computational modules is the programming ability of students. Some students lack the expertise to code simple routines, even with prior programming coursework. To support students, assignments can be scaffolded to incrementally enhance students' abilities in preparation for their final project.

### Main Findings

Scaffolding is an educational framework that emphasizes designing activities to help students gain skills and knowledge that is needed to solve more complex problems. Students are given additional support early in the learning process which is gradually removed. One method would be to have students master specific aspects of a problem, then practice integrating the pieces. Alternatively, students could be provided with a worked solution, then gradually have more of the solution removed until they can complete the problem independently. Designing activities using scaffolding can reduce students' cognitive load and allow them to develop mastery of the problem.

### Description

A scaffolded project has been developed for an upper-division course in Materials Science and Engineering. Students are required to simulate Fick's laws of diffusion using MATLAB. Intermediate assignments bridge students' limited programming knowledge with the skills needed for their final two-dimensional simulation. The modules are as follows:

- Module 1: Introduction to MATLAB - Students watch videos and complete interactive MATLAB tutorials, then perform simple programming assignments.
- Module 2: Introduction to the Finite Difference Method (FDM) - Students learn the finite difference method, which is applied to the calculation of derivatives and predictions of reaction concentrations over time.
- Module 3: Simulating Diffusion in One Dimension - Students implement the FDM to simulate diffusion along the x-axis [3].
- Final Project: Simulating Diffusion in Two Dimensions - Students extend their code from Module 3 to include diffusion in both the x- and y- directions, presenting their results in a written laboratory report.

### Relevance and Takeaways

This work specifically investigates scaffolding in programming-intensive learning activities, which can have a significant cognitive load for students still acquiring mastery in both the scientific content and computer programming. However, scaffolding can enhance student learning in many disciplines, and is particularly helpful for complex problems or large, multi-faceted assignments.

### Author Biographies

Susan P. Gentry is a Lecturer with Potential Security of Employment in the Materials Science and Engineering department at the University of California, Davis. In her current position at UC Davis, she is integrating computational modules into the undergraduate and graduate materials curriculum. She is specifically interested in students' computational literacy and life-long learning of computational materials science tools. In addition to her course improvements, she is also working on improving the experiences for transfer students at UC Davis.

## An efficient and effective strategy for developing student source attribution habits

Sarah Tinker Perrault  
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### **Purpose**

Appropriate source use, one of the most important academic writing skills, is surprisingly difficult to teach: it is a highly complex activity, and source use conventions vary among disciplines, making instruction especially tricky in general education (GE) classes that enroll many majors. Even though ways to use sources vary, all fields require attribution (signaling whether an idea is a source's or the writer's). I developed and studied the effectiveness of one strategy for teaching source attribution in a large-enrollment GE class where providing individualized feedback to students is difficult, if not impossible.

### **Main Findings**

Results suggest that even a small time investment by instructors can help students develop a stronger habit of attributing sources. I found an overall improvement of 24% in attribution use, from a starting average of 46.4% sentences to a final average of 70.3% sentences. Forty-seven (85%) of the students showed improvement, and twenty-two (40%) of the students increased attribution use by 30% or more. Juniors and seniors began with significantly higher rates of attribution than lower division students, but all years made at least a 20% improvement. The poster will share findings including ranges, averages, and statistical analyses.

### **Description**

This poster will include five sections.

**TEACHING STRATEGY & RATIONALE.** The poster will include the assignment, one of the models provided to students, the response rubric, and examples of feedback. It also will provide research-based reasons for the teaching approach.

**METHODS.** Fifty-five (69%) of the 80 students in the class gave written permission to study their work. Selecting similar assignments from the quarter's start and end, a colleague and I coded each sentence for attribution use. Inter-rater agreement was 95.3.

**FINDINGS.** See above.

**LIMITATIONS & FURTHER RESEARCH.** This study did not account for possible influences from other classes, nor did it include longitudinal data. Also, evidence suggests some students knew more about attribution than the study shows; a closer examination of the data set would be useful for determining how common this discrepancy was.

**APPLICATION TIPS.** The poster and discussion will provide tips on how to (1) offer frequent, low stakes practice, (2) respond via a simple rubric and targeted feedback, (3) and create and use models.

A handout with references, tips, and resources will be available.

### **Relevance and Takeaways**

The substantial shift in student attribution use in only ten weeks suggests that even a small amount of time and energy on our part can result in great gains in students' ability to signal whether they are sharing their own ideas or a source's. Furthermore, this approach appears to work without requiring large amounts of time that faculty may not have available, especially in large-enrollment GE classes. Overall, the poster and presentation offer instructors a practical approach to helping strengthen an essential academic skill.

**Author Biographies**

Sarah Tinker Perrault is Associate Professor in the University Writing Program and affiliated faculty in the Graduate Group in Education. Research areas include writing pedagogy, general education, and science communication. She has published a book, *Communicating Popular Science: From Deficit to Democracy*, and articles in *Composition Studies*; *Journal on Excellence in College Teaching*; *The American Journal of Bioethics*; and *Information Design Journal*. She teaches UWP 11: Popular Science and Technology Writing, UWP 18: Style and the Essay, UWP 120: Rhetorical Approaches to Science & Technology, UWP 121: History of Scientific Writing, and UWP 220: Rhetorical Approaches to Genre Study.

## AMI and ACS Care in Central Vietnam

Mykhaylo Vladyslavovych Sayenko  
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### **Purpose**

The goal of my research is to assess rapid diagnostic care in community, district, and provincial hospitals of rural, coastal, and urban areas of Central Vietnam. Using the data gathered, I aim to suggest methods for improving medical and economic outcomes by implementing Point-of-Care Testing.

### **Main Findings**

The current system of care for cardiac patients in Vietnam is not suited to provide adequate care for patients who have had an AMI. Significant improvements in cardiac care in Central Vietnam could be achieved through the implementation of Point-of-Care devices on ambulances. A national policy focused on improving the ambulance system along with Point-of-Care implementation would improve medical and economic outcomes in Central Vietnam.

### **Description**

I will be presenting a poster containing the following:

- 1) A description of the survey conducted in the Hue Province of Central Vietnam by a research team consisting of myself, two other students from UC Davis, two medical students of Hue University, and a professor of Hue University.
- 2) Several figures, tables, and a description detailing the workings of the hospital system in Central Vietnam, and describing the current state of care for patients with Acute Myocardial Infarction (AMI) and Acute Coronary Syndrome (ACS) in that region.
- 3) A map and figure detailing ways in which care for AMI and ACS patients could be improved in Vietnam through strategic placing of Point-of-Care (POC) devices.

### **Relevance and Takeaways**

My work is relevant to the UC Davis community because it demonstrates how to conduct a successful survey in a foreign country. It also describes the fundamental workings of a medical system in a less wealthy country than the US through the eyes of a student. I would like the main audience takeaways to be the differences between the medical system in the US and in Vietnam, and the potential impact of POC testing in improving medical and economic outcomes.

### **Author Biographies**

Mykhaylo V Sayenko: 5th Year NPB Student at UC Davis

## Incorporating Service Projects in Undergraduate Learning: Templates from dissimilar courses

Laci Gerhart-Barley  
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### **Purpose**

Incorporating service-based projects in coursework is an increasingly common component of course- and program-level learning objectives; however, coordinating service-based projects and incorporating student service learning experiences into graded coursework can be daunting. This project provides two templates for incorporating service learning projects into undergraduate coursework: one from a 100+ enrollment fully online Introduction to Women's Studies course offered at the University of South Florida (an R1 university serving ~36,000 undergraduate students), and the other from a 24 enrollment in-person introductory Biology and Society course offered at the University of Hawai'i, West O'ahu (a liberal arts university serving <3,000 undergraduate students).

### **Main Findings**

The goals of this presentation are to encourage discussion amongst faculty who already incorporate service learning as a component in their courses and faculty who are interested in doing so, but uncertain or wary of the benefits and drawbacks of service-based projects. The templates provide two dissimilar examples for structuring service learning which are intended to stimulate dialogue about such details as level of instructor involvement, student time commitments, development of assignments and prompts, and grading rubrics. The presenter particularly welcomes discussions of concerns and problems faculty have encountered when considering or developing service learning projects.

### **Description**

Service learning is defined here as approaches to teaching that engage students outside the classroom in volunteer service activities that benefit the university and/or community and which reinforce course content and learning objectives. Service learning can be a valuable instructional tool; however, many instructors are unsure how best to incorporate service learning into their classroom. This project provides templates from two dissimilar courses to facilitate discussion and encourage faculty to incorporate service learning into their courses. Template 1: in a 24-enrollment introductory biology course, the instructor coordinates habitat restoration and invasive species removal at two locations. Students propagate native plants, attend the restoration events, and complete a 1,000-word reflection paper on their perspective of the activities. Template 2: in a 100+ enrollment fully-online introductory women's studies course, students choose their own service learning activity from publicly available volunteer opportunities in the local community. Students complete assignments which guide them through choosing a volunteer activity, linking the activity with course content, completing the activity without supervision, and reflecting on the experience. The differences in course content, class structure, enrollment size, and service learning project structure make these two templates ideal starting points for faculty to adapt to their particular course goals.

### **Relevance and Takeaways**

Service learning is a valuable tool for engaging students in course content, and for developing a student body that is active in the betterment of the university and community. The templates described in this project have been iteratively developed over six semesters and can be adopted by UC Davis faculty as-is, or adjusted to better align with particular courses or instructor goals. The presenter can also serve as a resource to UC Davis faculty who are interested in support as they navigate incorporating a new tool into their teaching.

### **Author Biographies**

Dr. Gerhart is an LPSOE in the Evolution and Ecology Department at the University of California, Davis. She received her PhD in Ecology and Evolutionary Biology from the University of Kansas with Honors in 2013.



## Perspectives from an intensive skills-training workshop with a heterogeneous learner population: success takes many different forms

Karen Word, Beth M. Duckles, Phillip T. Brooks, Lisa K. Johnson, C. Titus Brown  
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### **Purpose**

The aim of this project is to improve our understanding of learner experiences and target future assessment efforts for a 2-week intensive workshop for biologists. Learners in this workshop range in status from undergraduate to faculty and post-PhD professional, in skill from curious novice to self-taught practitioner, and hail from multiple countries with variable command of English. They also reflect a full cross section of biological disciplines. While feedback for this course has been overwhelmingly positive in its 8-year history (2017 being its first year at UC Davis), the extent to which this reflects effective instruction is unclear. It is also unclear whether all learners are served equally well.

### **Main Findings**

This work explores the many ways in which learners may extract an experience that they deem positive and worthwhile from a program, and probes the question of what constitutes success in a setting of this kind. Future assessment efforts rely upon both our definition of success and the reliability with which we can characterize outcomes related to that definition.

### **Description**

We distributed surveys, conducted interviews and classroom observations, and collected in-class feedback from learners. We also distributed surveys to assess the experience of instructors and helpers. We plan to present findings related to learner perspectives on participation, the value of the learning community beyond instructor/helper relationships, support and challenges specific to novice learners and non-native English speakers, distinguishing values of advanced learners, and the perspectives of the instructors and helpers who volunteer to make this workshop possible. Plans for future intensive and continuing routine assessment of this program will also be discussed.

### **Relevance and Takeaways**

While this work arises out of an unusual setting -- training biologists of all stripes in computational skills -- the challenges faced in developing assessment plans for this program are ubiquitous. The heterogeneity of this learner population and the flexibility of the workshop setting offer a unique opportunity to think expansively about how education creates value for diverse learners and the institutions that thrive on their work.

### **Author Biographies**

Dr. Karen Word is a postdoctoral scholar in the Lab for Data Intensive Biology at UC Davis, working on assessment and program development for the Data Intensive Biology Summer Institute (DIBSI), which includes the 2-week ANGUS workshop. She also serves as Deputy Director of Instructor Training for Data Carpentry, a non-profit organization that develops and provides data skills training to researchers.

Beth M. Duckles, Ph.D. is a researcher and consultant who helps organizations apply social science research insights to business needs. She received her B.A. in Sociology/Anthropology from Earlham College and her Ph.D. in Sociology from University of Arizona. You can find her online at [beth.duckles.com](http://beth.duckles.com).

Phillip T. Brooks is a Postdoctoral Research Scientist at UC Davis in the Lab for Data Intensive Biology and Associate Director for DIBSI.

Lisa K. Johnson is a PhD Candidate at UC Davis in the Lab for Data Intensive Biology and in the Whitehead lab. Lisa served as Volunteer Coordinator/Instructor for DIBSI.

C. Titus Brown is an Associate Professor in Population Health and Reproduction at UC Davis, where his lab works on developing novel data analysis approaches and software for sequencing data. He also runs quite a bit of training for biologists, including DIBSI.

## An Analysis of Experts' Problem-Solving Strategies in Chemistry

Alexandra Tan, Nguyen "Brandon" Cao, Jennifer Bloomquist, Okechukwu Jimmy, Ozcan Gulacar  
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### **Purpose**

The purpose of this study is to explore problem-solving strategies of a group of STEM experts including professors, graduate students, and engineers in the context of chemistry. The problems were selected from a general chemistry topic and participants were asked to think aloud while trying to solve the problems. After documenting experts' characteristics in problem solving, their strategies and approaches to the problems will be compared to those of STEM undergraduates (novices) which were investigated in a separate study. Understanding differences between experts and novices should augment teaching practices and provide effective strategies to the students struggling with general chemistry problems

### **Main Findings**

This ongoing study aims to answer the following questions:

1. What general problem-solving strategies do experts, such as biology and chemistry professors and graduate students, use while solving chemistry problems?
2. How do experts in different fields approach chemistry problems differently?
3. How are the strategies used by experts different from those utilized by undergraduate chemistry students?

In order to answer these research questions, the think-aloud protocols were transcribed. Then, experts' solutions together with the transcripts of the think-aloud protocols will be examined and coded by using a previously developed and published coding system.

### **Description**

In each think-aloud protocol, participants were given between four or five chemistry problems to solve. As each participant worked through the problems, they were instructed to voice their thoughts, including the processing of the questions as well as the calculations being used. While coding the experts' solutions to the given problems, coders will also pay attention to and note other important details in the solutions such as uncommon strategies and mistakes, which may not be a part of the current coding system. If necessary, new codes will be developed to better capture those significant elements of expert problem solving.

During the coding stage, each question will be broken down into numerous steps and each step will be given a code. The comparison of the expert and novice codes will provide a comprehensive understanding of the participants' problem-solving methods.

### **Relevance and Takeaways**

The findings of this research will aid in identifying optimal methods for solving chemistry problems, which can be incorporated into general chemistry curriculum at the UC Davis and other institutions. Sharing the analysis of the differences between novice and expert problem solving could allow students to better understand common problem-solving challenges. Additionally, insight into the thought processes of novice students could help educators target the source of confusion in student problem-solving methods. Differences in problem-solving strategies may also illuminate how learners transition from novice to expert. In summary, this research provokes questions about the nature of knowledge, expertise, and learning in the STEM field that are constructive in any academic environment.

### **Author Biographies**

Alexandra Tan is a second year Cellular Biology major at the University of California, Davis. She has been assisting in Chemistry Education research for one year and has had previous experience in Applied Mathematics research. She has work experience in Microbiology as a lab technician assistant and is currently working as a Chemistry tutor.

Nguyen "Brandon" Cao is a second year Biological Sciences major at UC Davis. He is participating in research for the first time in his academic career exploring education in the field of chemistry. In the future, he is interested in pursuing research in the fields of biology and organic chemistry.

Jennifer Bloomquist is a recent UC Davis graduate with a BS in Biological Sciences and BA in Psychology. Her prior experience includes serving as a reader for MIC101, working with Professor Silvia Carrasco to create BIS102 course resources, volunteering on campus with the Health Education and Promotion program, and volunteering with the student-run Willow Clinic in Sacramento.

Okechukwu Jimmy is a second year student at UC Davis. He is currently Undeclared and is searching for his passion through exploration of different classes and careers. This project with Dr. Ozcan Gulacar related to education in the field of chemistry is his first excursion into research.

Jennifer Kopetzky is a second year studying Biochemistry and Molecular Biology and minoring in Global Disease Biology. Currently, she is working under Dr. Ozcan Gulacar in his research on Chemical Education, where they are focused on understanding the creation and development of knowledge structures throughout the general chemistry series. In the future, she is interested in going into clinical research revolving around the study of disease.

Raven Navarro is a second-year Neurobiology, Physiology, and Behavior major. Some of her research interests include neural connectivity, cognitive development, and neurodegenerative disorders. Raven is a board member for Alzheimer's Buddies at UC Davis, where she regularly visits and socializes with dementia residents in senior care living facilities.

Ozcan Gulacar has a Master's degree in Physical Chemistry and a Ph.D. in Science Education. For the last 18 years, he has worked at different educational settings including international high schools and doctorate and Master's granting institutions. He has designed and taught several graduate and undergraduate chemistry and science education courses for a wide range of audience. Because of his strong interest in investigating the effectiveness of different teaching methods and tools, he has applied and received grants and established collaborations with colleagues from different fields and different countries. Besides teaching and running research projects, he has also developed and organized workshops about implementation of social constructivist methods and effective use of technological tools in science classrooms.

## Collaborative Learning: Characterizing Success

Miguel Macias, Julia Chamberlain

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### **Purpose**

Collaboration is a powerfully engaging way to learn, in academic research and in the classroom. Students in higher education have seen a rise in collaborative learning opportunities in coursework as instructors implement active learning strategies to enhance student engagement. However, not all collaborative learning activities are equally successful.

### **Main Findings**

What qualities define success in collaborative learning experiences, and what types of collaboration lead to successful learning?

### **Description**

In this work, an international team of undergraduate students and faculty engaged in detailed self-reflection on our past collaborative learning activities as an inquiry into what defines success. Using thematic analysis, we identify and describe five distinct domains that influence successful classroom collaborations: 1) familiarity with collaborative learning, 2) relationships, 3) benefits, 4) motivations, and 5) the design and process.

### **Relevance and Takeaways**

This poster presents our preliminary findings and questions to explore in our continued analysis.

### **Author Biographies**

Miguel Macias is a 3rd year Biochemistry major.

Julia Chamberlain is a Lecturer with Potential for Security of Employment in the Chemistry Department.

## Learning Assistants in General Chemistry

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### **Purpose**

The Learning Assistant model [1] recruits undergraduate students who have performed well in a transformed science course, and offers them a role assisting students with their learning in class during a subsequent quarter. [1] Otero, V., Pollock, S. and Finkelstein, N., Am. J. Phys., 2010, 78, 1218–1224.

### **Main Findings**

In this poster, we present preliminary outcomes of facilitating active learning with Learning Assistants in General Chemistry lectures and discussions in Fall 2017, and discuss the challenges and lessons learned during our first large-scale implementation in first-year chemistry courses at UC Davis.

### **Description**

Unlike an “undergraduate TA” role, Learning Assistants are trained to help their peers in practices such as metacognition, helping students voice their ideas, listening, and fostering student discussion. As part of their training and practice, Learning Assistants take a seminar course in science education theory, meet weekly with STEM teaching faculty to plan the week’s facilitation, and practice this facilitation with undergraduate learning teams in lecture and discussion sections.

### **Relevance and Takeaways**

At other universities, Learning Assistant programs have contributed to transforming and improving the undergraduate student experience in large enrollment science courses, as well as recruiting a greater number of K-12 science teachers and engaging research faculty in course transformation and teacher recruitment.

### **Author Biographies**

Lan Chi Nguyen is a 4th year pharmaceutical chemistry major.

Julia Chamberlain is a Lecturer with Potential for Security of Employment in Chemistry.

## Active Learning in an Advanced Physiology Course

John Payne

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### **Purpose**

The purpose of this course was to facilitate/improve the understanding of physiology by students interested in careers as health science professionals. My motivation for developing and teaching this course was three-fold. First, I wanted students to use problem solving and critical thinking skills. Second, I wanted students to retain knowledge of systems physiology, a basic science critical to their careers as future clinicians. Third, I wanted students to better understand the pedagogy of active learning, a form of instruction that promotes a critical competency of all health science professionals— life-long learning.

### **Main Findings**

Based on my observations and student evaluations, the course appeared to accomplish many of its goals. While students found the course challenging because of the amount of reading/writing outside of class, they understood the importance of independent learning. Small group, in-class collaborative learning sessions, centering on case studies of organ dysfunction, were praised by the students. Students expressed an improved understanding and retention of physiological principles and concepts. As an exploratory work, a number of discussion questions arise: 1) how can I support more online teacher/student interactions? 2) how can I collect evidence to inform future iterations of the course?

### **Description**

The course covered the fundamental mechanisms and pathophysiological basis for animal and human diseases. The course made extensive use of active learning techniques, promoted independent learning, and helped to develop problem-solving and critical thinking skills. I employed lectures but stressed small group sessions in order to promote learner centeredness, active participation, and collaborative learning. Students were required to accomplish individual reading and writing assignments outside of class for each physiological system, to accomplish group case study assignments both inside and outside of class, and to present their group case study answers to the entire class. All quizzes and the cumulative final exam were composed entirely of short answer-essay type questions that required students to integrate knowledge across organ systems and to apply problem solving and critical thinking skills in situations/cases new to them. I graded all course assignments and exams myself. As the instructor, I was able to interact with students in class and assess in a unique way each student's knowledge and competency.

### **Relevance and Takeaways**

My experience with this course indicated that it is a promising design for other instructors of upper division science courses to consider. When implementing active learning, I found it imperative that the instructor obtain student "buy-in" early in the course, i.e., students must understand their role in learning. As taught Spring quarter 2017, the class size was 24 students. Class size is an important consideration for success of the course. Class size could be increased, but it would require more discussion facilitators and would lose the personalized instruction afforded a smaller class size.

### **Author Biographies**

Dr. Payne is a professor in the Department of Physiology and Membrane Biology. His research has centered on chloride transport in epithelia, neurons, and cardiomyocytes. He has taught medical physiology at UC Davis School of Medicine for over 20 years, and he was Co-IOR of the medical physiology course for 15 years. Dr. Payne is firm believer in active learning and has employed various forms of active learning for medical school instruction in both small (<35 students) and large (>100 students) class formats for over 10 years.

## Team-based learning and student outcomes: An investigation of how individual and team characteristics are associated with student perceptions and learning outcomes

Heather Jane Hether  
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### Purpose

Team-based learning (TBL) is a structured pedagogical approach in which students spend the majority of classroom time engaged in assigned teams, working together to solve problems through the application of course material (Michaelsen, 2004). The purpose of this exploratory study is to examine how student and team characteristics are associated with student learning and attitudes toward team-based learning. Specifically, this study seeks to replicate and extend previous research that examines how ability, efficacy, motivation, extroversion/introversion, and team productivity are associated with student learning and attitudes toward this pedagogical approach.

### Main Findings

The findings from this study suggest that some student characteristics are more strongly associated with positive perceptions of team-based learning. Specifically, this study found that self-efficacy, intrinsic motivation, and extroversion were all significantly positively correlated with perceptions of TBL, while student ability was negatively correlated with perceptions of TBL. Findings also suggest that higher performing teams had more positive perceptions of team-based learning and higher collective efficacy, although higher performing teams were not correlated with higher grades.

### Description

The current study consists of a student survey conducted in two upper division Communication courses in the spring 2017 quarter wherein the instructor/researcher applied key techniques from team-based learning. After receiving IRB approval, students in two different courses were invited to participate in the survey. Participation was not mandatory. An online survey was created in Qualtrics and the link was emailed to students during the last week of classes. Students had approximately 10 days to complete the survey. The survey sample size is N = 101 students across both courses. Response rate = 91%. The independent variables included self and team (collective) efficacy, perceptions of team performance (Thompson, 2009), motivation, and introversion/extroversion. Dependent variables included student perceptions of the benefits of team-based learning, and learning outcomes, as measured by grade on last exam and expected grade in the course. SPSS V. 20 was used for data analysis. Student characteristic data (gender, race/ethnicity, transfer status, first generation student) were also collected. Correlation and multiple regression analyses were conducted to examine how the independent variables were associated with the outcome variables.

### Relevance and Takeaways

This study is relevant to our community of scholarly educators because it explores the implications of applying different pedagogical practices within our classrooms. Further, it suggests the most effective pedagogical practices must be informed by student characteristics and that students' preferences for teaching methods vary across ability and personality characteristics. The primary insight that I hope this presentation will inspire among the audience is a reflection on the importance of employing a variety of pedagogical practices, including both lecture and active learning techniques, to meet the diverse needs of students.

### Author Biographies

Dr. Heather Jane Hether is a faculty member in the Department of Communication at the University of California, Davis. Her research interests focus on digital media in the health and education contexts; health communication; and innovative pedagogy. Dr. Hether's research has been published in leading academic journals, including the *Journal of Health Communication* and *Public Relations Review* and she has presented her work at national and



international conferences. Dr. Hether has held previous academic and research positions at the University of the Pacific in Stockton and UCD's Center for Healthcare Policy and Research in Sacramento.

## Supporting Scientific Literacy

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### Purpose

Scientific thinking is the foundation supporting the scientific inquiry process. Previous studies have suggested that K-12 and college students often experience difficulties in understanding and engaging in scientific thinking. The present study is designed to investigate the development and learning of scientific reasoning strategies in college-aged adults. The key issue addressed in this project is the investigation of the nature of difficulty that college students experience in understanding and using the central scientific processing strategies. The present project also aims to examine how the effective use of scientific inquiry processing strategies would facilitate the acquisition of science content knowledge.

### Main Findings

Based on the findings generated in the current study, we plan to further examine key issues regarding scientific thinking and learning in college students. In the follow-up studies, we plan to examine college students' understanding and use of scientific reasoning strategies across different majors (science and engineering, social science, and humanities majors). These findings can also be extended to individuals at different age levels and grades, allowing examination of the development of scientific processing strategies. Furthermore, the present findings can also be extended to investigate scientific thinking and learning in students of diverse social-economic statuses and cultural backgrounds.

### Description

The central component of scientific reasoning involves the systematic manipulation of variables when testing a hypothesis using the control of variables strategy (CVS). It has been demonstrated that inquiry based instruction is an effective approach for facilitating the acquisition and transfer of a hypothesis testing strategy; however, the nature of the instruction that best facilitates student's learning of transfer of scientific reasoning skills is unclear. The present study explores the effectiveness of two training approaches: Procedural instruction provides the learner with the or the concrete steps involved in the CVS process, while conceptual instruction provides the learner with the "why" of using CVS, or the rationale behind those steps. Each type of instruction will be provided after the assessment of students' processing strategies during the pretest, and the relative effectiveness of these instructional approaches to promoting scientific processing skills will be examined and compared in a posttest. Conceptual training is expected to lead to broader generalization of the processing strategies that could be transferred to a wider range of scientific reasoning tasks, while procedural training is predicted to lead to a relatively narrow range of learned strategies that can be transferred only to tasks requiring similar procedures.

### Relevance and Takeaways

This work is relevant to members within the UC Davis SoTL community because the premier aims are to: 1) use rigorous research methods to identify areas of scientific reasoning that college students find difficulty with, and based on these findings, 2) develop and test instructional training techniques that target difficulties for students of varying majors/backgrounds, 3) use research findings to refine how scientific reasoning strategies are taught and 4) share our conclusions with scholarly educators. We hope the audience will leave our presentation with insight into how scholarly research can support science instruction in service of meeting learner needs.

### Author Biographies

Zhe Chen is a professor of Human Development and Psychology at the University of California, Davis. Chen's research focuses on how children's reasoning and problem-solving strategies change with age and experience, and how environmental and cultural factors shape children's thinking and learning. Chen has taught undergraduate courses such as Infancy and Early Childhood, and Cognitive Development, and graduate seminars such as Children's Thinking and Learning, and STEM Learning.

Gina Jaeger is an associate instructor for the Human Development department at UC Davis, where she received her PhD in 2016. Her research examines learning and problem-solving during childhood and early adulthood, with emphasis on how learner's utilize gesture to facilitate thinking, speaking, and reasoning. Gina has taught several undergraduate courses, including Social and Personality Development, Infancy and Early Childhood, and Cross-Cultural Development, and is continually integrating new ways of supporting student learning through formative assessment, innovative educational technology, and reflection activities.

Garrett Jaeger is an Instructor in Child Development at California State University, Sacramento, and the Thomas Murphy Postdoctoral Fellow at the Center for Childhood Creativity. His research focuses on how ambiguous instruction and feedback impact the creativity of divergent thinking. This research provides insight on creative cognition, and its digital applications are promising for their use in pedagogy and formative assessment of college students in their development of higher level cognition. Garrett has taught courses in developmental psychology, cognitive development, and research methods, and has spearheaded many initiatives to support interdisciplinary research and teaching on college campuses.

## Integration of clinical scenarios into pre-clinical biochemistry education of medical students

Colleen Sweeney, PhD  
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### **Purpose**

It can be challenging to establish the clinical relevance of the foundational elements of medical education. This has been a long-standing issue for pre-clinical biochemistry education at medical schools. We developed a novel method for demonstrating how biochemistry directly impacts patient care, using interactive experiences with clinical simulation and ultrasound. These experiences built on basic material delivered in the classroom, with the goal of bringing metabolic pathways “to life” for students. This effort was a collaboration between the pre-clinical and clinical faculty. In its first iteration last academic year, we did a basic assessment of learner satisfaction and knowledge retention.

### **Main Findings**

Students enjoyed the interactive sessions. They reported that these sessions increased their understanding of the clinical relevance of biochemistry. Examples of students’ comments include: “The ultrasound portion allowed us to take biochemistry and apply it to something practical” and “made biochemistry clinically relevant and fun!” The students’ post-session quiz scores showed knowledge retention and did not improve after an additional focused journal club, indicating these interactive sessions may have been sufficient on their own. In the current academic year, we are expanding the sessions and plan to make them a permanent part of the course.

### **Description**

We began discussing the needs of medical student learners. We found their primary and highly consistent complaint was a lack of clinical applicability of basic science content. We set out to build basic clinical cases using a high-fidelity simulator that would showcase how lactic acid over-production can be caused by a variety of different biochemical mechanisms, each of which comes from specific pathophysiology and requires dedicated treatment to address. Eight scenarios were written. Students went through these scenarios in small groups of 6-8 students with associated debrief, and then had a chance to discuss their cases in small groups with colleagues, to share their knowledge and experience. Groups were led by clinical faculty. For the ultrasound portion of our innovation, four 10-minute interactive lectures were given. Each example was tied to a biochemical pathway and an associated disease which the students learned about in class. Ultrasound was chosen because it is a particularly well-suited visual tool to help students grasp complex biochemical concepts, allowing students to see pathologic changes to the body and the changes which occur upon treatment. Furthermore, Ultrasound is a key skill all students will use in the clinical setting but is currently under-represented in our curriculum.

### **Relevance and Takeaways**

Medical students appreciate basic science which is delivered in a clinical context. These sessions provide an opportunity to integrate important concepts from biochemistry, anatomy, physiology, pathology, and physical exam, reinforcing learning and providing early experience in the integrative thought processes required in the practice of clinical medicine. The modest increase in realism afforded by simulated scenarios can be used to improve student engagement in the pre-clinical medical education.

### **Author Biographies**

Colleen Sweeney, PhD, Professor of Biochemistry and Molecular Medicine and Instructor-of-Record for the Molecular Medicine Course

Ian M Julie, MD, MAS, Assistant Professor of Emergency Medicine, Medical Director, UC Davis Center for Virtual Care and Director, Medical Simulation Fellowship

Sarah Medeiros, MD, MPH, Assistant Professor of Emergency Medicine and Director of Technology Enabled Active Learning

Michael Schick DO, MA, FACEP, FAAEM, Assistant Clinical Professor of Emergency Medicine and Director of Technology Enabled Active Learning

## Exploring the Interaction Between Retrieval Practice and Learner Motivation in Online Video Instruction

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### Purpose

The increased popularity of online video to supplement or replace face-to-face lectures has created the need to identify best practices for increasing engagement. In particular, the ability to introduce pop-up questions throughout video instruction is thought to increase engagement and retention. However, unlike classroom studies, there is a paucity of evidence that questions during video instruction produce gains in long-term retention or engagement. Additionally, knowing whether to place questions throughout a video or at the end of a video to increase learner engagement has important financial and pedagogical implications. Interleaved questions during video are significantly more expensive to produce. The purpose of this study was to determine the effect of question placement during video instruction on learner motivation and knowledge retention.

### Main Findings

The instructional intervention consisted of a web-based learning module with two video lessons (3 minutes each) on the basics of airway management. 155 participant from Amazon's Mechanical Turk were randomized to receive either 1) question-embedded videos, 2) questions-at-the-end videos, or no questions. No prior experience was required to complete the learning modules. Videos were developed in-house and included an expert demonstrating various techniques of airway management using a partial task trainer in an operating room setting. Keller's 36-item IMMS survey instrument was used to assess motivation levels across three domains (attention, relevance, confidence, and satisfaction). A customized Qualtrics survey was created to deliver content, collect survey data, deploy the final exam at 1 week after instruction.

Exam scores for the embedded-question condition (mean rank = 34.67) were significantly higher compared to the no-questions condition (mean rank = 23.12),  $U = 241.5$ ,  $z = -2.692$ ,  $p = .007$ . Similarly, exam scores for the post question group (mean rank = 51.20) were statistically significantly higher compared to the no-questions group (mean rank = 32.88),  $U = 514.5$ ,  $z = -3.156$ ,  $p = .002$ . However, distributions of exam scores between the embedded- and post-question groups were similar, as assessed by visual inspection. Exam scores were not statistically significantly different between the two embedded group (Mdn = .6) and post group (Mdn = .6),  $U = 2,1300.5$ ,  $z = 1.242$ ,  $p = .214$ .

### Description

We observed the testing effect in videos that incorporated interactive questions either during or immediately after instruction but found no benefit in one approach over the other. Retention was lowest when interactive questions were absent from video instruction and significantly greater when they were present. Another finding from this study was that although the IMMS exhibited internal validity evidence, it could not explain differences in motivational effects between different learning conditions.

### Relevance and Takeaways

The addition of questions during classroom instruction is known to enhance long-term retention by increasing learner engagement. Referred to as the "testing effect", retrieval practice improves memory compared to re-studying material. The increased used of videos to replace or supplement classrooms has created a challenge - videos can be just as passive as lectures! Does adding questions to your video increased engagement and long term retention? Where should you place the questions - at the end or during the video? This study aims to answer these questions and makes recommendations to instructors and developers on how to best deliver evidence-based video instruction.

**Author Biographies**

Brian Pitts is a practicing physician with UC Davis Health. He is an Associate Professor in Anesthesiology and Director of Online Learning for the UC Davis School of Medicine.

Dr. Pitts studies how effective teaching strategies help medical students, residents physicians, and practicing physicians provide safe and effective patient care. His work with the UC Davis School of Medicine focuses on curriculum design, competency assessment, and curriculum review. He has a keen interest in how the flipped classroom methodology is used to promote active and engaged learning.

## Concept mapping as road to critical thinking: The power of student representations of knowledge

Annalisa Teixeira  
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### **Purpose**

This presentation defines concept mapping and summarizes current research surrounding its application in building conceptual knowledge and critical thinking among students. Data in the form of field notes, survey responses and case studies will be presented, showcasing how students have successfully utilized concept mapping in their courses, deepening their engagement with texts and lecture and optimizing their recall of conceptual information. The aim is to share this method with the teaching community and encourage its incorporation as a pedagogical practice, while also highlighting Study Skills as a campus partner in optimizing student learning outcomes. Study Skills serves as a resource to undergraduates, providing academic success coaching on concept mapping, active reading, and other academic skills.

### **Main Findings**

A majority of students seeking out Study Skills assistance report using passive study strategies to develop understanding and recall: reading textbooks, rereading notes, attending lecture, and listening to podcasts. Preliminary conversations with students have identified concept mapping as an easy-to-implement technique that helps them transition from passive knowledge building to an active, personal organization of understanding. Questions I have for attendees would be (1) how would concept mapping be applied in your discipline (2) have they incorporated concept mapping as an assignment or activity previously, and (3) if so, what outcomes they have observed.

### **Description**

The content of the submission would be as follows: (i) definition of concept mapping and the learning principles stemming from cognitive learning science on which it operates (ii) brief summary of empirical research on its application in college teaching (iii) presentation of findings from coaching sessions with students on concept mapping and subsequent student-reports of implementation and learning outcomes.

### **Relevance and Takeaways**

This presentation speaks to a number of challenges that college educators face. How can we support students in constructing their own understanding of what is covered in textbooks and in lecture? What assignments can we craft that encourage effective pre-reading prior to lecture? How can we support critical thinking and conceptual knowledge building among our students, encouraging them to go beyond rote memorization, and helping them to identify core concepts from supporting details? Along with concept mapping being an easy-to-implement study technique for students, it can be utilized by educators as a warm up activity, pre-writing exercise, reading assignment, or assessment technique, among other uses. Additionally, if instructors would be interested in exploring the use of concept mapping in their teaching in the form of an empirical study, I would like to offer my time as a collaborator and consultant.

### **Author Biographies**

Dr. Annalisa Teixeira coordinates Study Skills at the Student Academic Success Center at UC Davis and serves as a learning specialist, facilitating workshops and holding coaching sessions on academic skills development for Davis undergraduates. Her research interests center on pedagogy, cognitive learning science, assessment and evaluation, and educational technology.



## The Workshop (WORK IN PROGRESS)

Jennifer Colmenero  
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### **Purpose**

The purpose of my work will be to investigate and analyze the genre of the workshop as a way of engaging with people in order to spread information. My questions are: "What is a workshop?" and "How do workshops accomplish their goals?" My motivation for doing so is to suggest alternate models of reaching the same kinds of objectives that are healthier for a university community. My working thesis is that the workshop model should be abandoned or at least heavily revised in favor of a more sustainable model focused on building community relationships.

### **Main Findings**

I don't have major findings yet because I'm still doing research. One interesting thing I've found out is just how little literature exists on this topic (and how difficult that literature is to access).

### **Description**

Although I do think this fits the description of a "conceptual" project, I would prefer to present it in the form of a talk rather than poster board because the latter is a genre rarely used in my discipline.

### **Relevance and Takeaways**

I think this work is relevant. I'm also involved in the Teaching Assistant Consulting Program and my desire to investigate this question came out of my job here (which involves giving workshops). I think if I'm right, then changes to the way we do things would positively affect our university (and, since this model is by no means limited to UC Davis, it could by extension be useful to other universities and practitioners as well.

### **Author Biographies**

I am a 5th year PhD student in the English department as well as a member of the Teaching Assistant Consulting Program at UC Davis. This fall I am teaching Introduction to Literature.

## Using Analogy and Interactive Simulation for Teaching a Sophomore Project-Based Class in Electrical and Computer Engineering (WORK IN PROGRESS)

Hooman Rashtian

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### Purpose

Electrical engineering students usually have to wait a long time before acquiring the mathematics and physics prerequisites required to take their first technical courses. This long wait time causes some students lose their interest in electrical engineering. To address this retention problem, the ECE Department has come up with the idea of designing a 4-unit project-based class for sophomore students. While the laboratory part of this class is exciting for the students, teaching the theory behind the operation of the implemented system is a challenging task. To address this challenge, effectiveness of using physical analogies and interactive simulations is investigated.

### Main Findings

At the end of Spring Quarter 2017, a question was added to the course evaluation questionnaire to ask students' opinion about the effectiveness of using these analogies and simulations:

The analogies, interactive simulations, animations and videos used by the instructor were helpful in intuitively understanding the topics discussed in the lectures:

5) Strongly Agree 4) Somehow Agree 3) Neutral 2) Somehow Disagree 1) Strongly Disagree

25 out of 58 students answered the question, 14 of them (56%) strongly agreed, 8 (32%) somehow agreed and 3 (12%) were neutral.

For future work, designing more effective interactive simulations is being studied.

### Description

In this class, students are introduced to different topics that they will cover in detail in their upcoming junior and senior years. At the same time, they design a complete system in the course project that involves applying this introductory knowledge of different branches of electrical engineering into an actual engineering project. Since many of the students in class have not yet taken or are concurrently taking "PHY 9C" and "MATH 22B", using almost any math or physics concepts is burdensome for at least a portion of the class. To address this challenge, a teaching style based on using physical analogies and interactive simulations is adopted.

One of the most useful analogies when teaching electrical engineering concepts qualitatively is the "water analogy". While analogies are powerful tools for intuitively understanding concepts that may need a math and physics background, it is not always possible to find easy-to-understand ones. Another technique that may be helpful in such cases is to use interactive simulations that give students the ability to understand a concept without being have to delve into the details of theories and formulas. This article details some of these analogies and simulations.

### Relevance and Takeaways

This work would be beneficial for instructors in engineering departments where student retention is a serious problem. While including a project-based class for sophomore students can alleviate this problem, teaching such a class would be challenging since many of the students do not have the necessary math and physics background. My intention is to raise the thought that we need to use alternative approaches to teach such courses.

**Author Biographies**

Hooman Rashtian received the Ph.D. degree in Electrical and Computer Engineering from the University of British Columbia, Vancouver, BC, Canada in 2013 and the M.Sc. and B.Sc. degrees in Electrical Engineering from Isfahan University of Technology, Isfahan, Iran, in 2008, and 2006, respectively. He was a Postdoctoral Scholar at Davis MM-Wave Research Center (DMRC) at University of California, Davis from 2014 to 2016. Since July 2016, he has joined the Department of Electrical and Computer Engineering at University of California, Davis as a Lecturer with Potential Security of Employment (LPSOE).

## Putting Pedagogical Theory into Practice: A Metacognitive Self-Study (WORK IN PROGRESS)

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### **Purpose**

My presentation explores the relationship between pedagogical theory and practice. Focusing on my own experiences teaching UWP 1 (Expository Writing), I investigate my successes and failures in designing syllabi and assignments aimed to integrate a particular pedagogy, ecocomposition, into the University Writing Program's common syllabus, which is based on a different composition pedagogy, called Writing About Writing. Given the failure of my first attempt to create an "ecompositional" assignment—it was too confusing—I interrogate what it means to apply theoretical scholarship to one's teaching practice.

### **Main Findings**

My exploration of scholarly teaching raises questions about how we prioritize our teaching goals when putting theory into practice. I first attempted to use ecocomposition to get my students to think critically about how language shapes our understanding of space and place, but I have since realized that this is not the goal of the composition class—and that I already draw on the field's scholarship when I encourage students to see themselves as experts in a variety of literacy practices not necessarily taught in school. This use of ecocomposition does not require my students to understand the theory itself. Theory should in most cases not be translated directly into an assignment prompt; instead, it has the greatest effect on student learning when it enters the classroom as the basis of the instructor's pedagogical ethos.

### **Description**

My poster narrates my experiences drawing connections between ecocomposition and Writing About Writing, then designing a "Literacy Place Narrative" assignment that I felt integrated the two pedagogical approaches, and finally replacing that assignment with a "Literacy Map" project. My newer approach to scholarly teaching allows students to engage in higher-order thinking without subjecting them to a single analytic approach. It simultaneously fulfills the UWP 1-wide learning outcomes more successfully than the previous essay prompt, because it shifts the students' focus back to their own literacies, the revision process, and multimodal composition.

To contextualize my narrative of course design and to model the learning outcomes that I expect of my students, my poster includes a metacognitive reflection on the broader implications of my experience. I came to realize that ecocomposition should not be about the environment and place, per se, but that its most significant contribution is its attention to how language and knowledge making are situated in natural, social, cultural, and political places. Looking back, I see that this is reflected in my teaching philosophy: I do not see myself as an expert on the perfect way to write, and I seek to empower my students to revalue the knowledge that they bring to the classroom.

### **Relevance and Takeaways**

I hope that my poster presentation will provoke my audience to reflect on their own practices of applying scholarship to teaching and to reassess how they prioritize learning outcomes based on the theory that informs their pedagogy. I also aim to show how scholarly teaching can have an impact on the power dynamics of the classroom—underlying a theory's thematics is also a statement on the roles that student and instructor ought to play in the classroom. I see my ability to upend my students' expectations about their seemingly skills-oriented required writing class as the biggest success of my scholarly teaching practice. Ideally a theoretical pedagogy, applied well, can help students think critically about what they want out of their education in the first place.

**Author Biographies**

Sophia Bamert is a PhD candidate in English. Her dissertation is on representations of American urban space in the late nineteenth and early twentieth century. She reads fiction in relation to sociology and urban planning to understand how racialized neighborhood borders were imaginatively—and then physically—created. She also has studied rhetoric and composition and teaches in the University Writing Program.

## Genre Awareness Pedagogy in Advanced Composition: Workplace Transfer (WORK IN PROGRESS)

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### **Purpose**

The purposes of this presentation are 1) to describe the genre awareness pedagogy aimed at workplace transfer in an advanced composition class comprised mostly of seniors at UC Davis; and 2) to share the results of pre and post course student reflections about how students believe their new genre knowledge will help them as they move into, or continue in, professional settings. In short, this presentation will aim to answer the questions: can genre awareness pedagogy, according to graduating seniors, aid transfer to the workplace? If so, in what ways might it contribute? What are the possible limitations?

### **Main Findings**

Though explicitly teaching specific genres may often lead to reductive, formulaic approaches, teaching how genres arise and change due to specific rhetorical situations helps to eliminate the over simplification of academic writing. Writing instruction that facilitates genre awareness rather than genre acquisition may be useful for those who will face uncertain and fluid writing situations in the workplace after graduation.

### **Description**

I will first provide the theoretical context for choosing genre pedagogy for writing instruction. Next, I'll discuss the advanced composition class and the major assignments. Finally I'll share the students' before and after class reflections on the use of the pedagogy. The data include pre/post reflections, and a small coded sample of the results. I will provide handouts of the major assignments.

### **Relevance and Takeaways**

I would like to share how this pedagogy may contribute to writing instruction for underrepresented students at UC Davis. Though my presentation is about a writing class, the ideas may be relevant to any instructor looking to incorporate genre theory and analysis into a course.

## Easing Transition to College Mathematics using ALEKS

Ka Wai Wong

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### **Purpose**

First-year students often encounter difficulties in their math courses due to the gap between high school and college-level mathematics. In this study, we provided an online tutorial mathematics program (ALEKS) to a group of incoming students for self-learning over the summer. We analyzed the potential benefits of ALEKS in improving students' performance in the math placement exams and in easing their transition in college courses at UC Davis.

### **Main Findings**

The main finding is that ALEKS helped students perform significantly better in the math placement exams. Subsequently the students were allocated into standard calculus courses without going through extra workload or pre-calculus preparation. Since the participation of students in this study was on a voluntary basis, we wish to recruit more students to take part in the study in the coming summer's cohort. In the past summer's study, we drew this conclusion based on the 23 out of 100 students in total.

### **Description**

We analyzed ALEKS user's behavior by looking at their individual learning progress. Also, we measured the correlation between the ALEKS placement exams and the existing placement exam at the UC Davis mathematics department in order to understand how accurate the ALEKS test score indicates students' performance in the actual test. Finally, we want to find out how efficiently ALEKS added value in students' preparation for their actual mathematics placement exams.

### **Relevance and Takeaways**

Our work can serve as a reference to the math department in improving the current support to students in their preparation for the math placement exam. ALEKS program can be offered in future over the summer to freshman students to ease their transition to UC Davis in calculus courses.

### **Author Biography**

I am a second-year PhD student at the mathematics department. I have great enthusiasm and strong desire in helping students overcome difficulties in their math studies.

## Do Engineers Dislike Writing?

Stephanie Pulford and Amanda Modell

Center for Educational Effectiveness

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### **Purpose**

There is a common perception that engineers and engineering students are averse to writing, which may contribute to difficulties in engineering writing education as well as writing-intensive education in general at a STEM-focused institution such as UC Davis. In this work, we complicate the view that engineers are not interested in writing with empirical evidence that tells a more complex story. This may enable instructors to meet their students where they are - and create more inclusive learning environments.

### **Main Findings**

In a Likert and open-ended survey administered to UC Davis students in Fall 2017, students indicated high levels of writing apprehension as well as high levels of writing affinity. Writing apprehension was the highest-reported demotivational trait, and also the most divisive one. Students' attitudes about writing are diverse - just like they are.

### **Description**

Students in an engineering writing class and students in an engineering course that does not focus on writing were surveyed in Fall 2017. The survey included Likert and open-ended items in an effort to assess student attitudes toward writing, as well as their self-efficacy. Common perceptions around writing and engineering identity have been around since the mid-twentieth century, and the skills that are valued in engineering curricula have changed since then, to reflect a more well-rounded approach that includes engineering communication. At the same time, engineering students are much more diverse in the last decades.

### **Relevance and Takeaways**

Students may have more complex views on writing than might be assumed. Cultivating an inclusive learning environment where students see themselves and their experiences reflected and have opportunities to build community amongst one another can support the development of all engineering skills, including writing. A cooperative, non-competitive environment that allows students multiple attempts at accomplishing tasks and includes information about engineering ethics are all ways to accommodate a wider breadth of students in engineering classrooms, and to distribute the educational resources UC Davis has to offer more equitably.

### **Author Biographies**

Amanda Modell is a graduate student researcher at the Center for Educational Effectiveness at UC Davis, where she currently conducts research on engineering writing education and engineering identity. In addition to research, Amanda has worked in graduate student professional development as a Teaching Assistant Consultant and Teaching Assistant Consultant Coordinator, where contemplative, inclusive, and feminist pedagogies informed her work. She has also contributed to curriculum development for graduate student instructors and pedagogy resources for faculty and graduate students. As a Cultural Studies PhD candidate, Amanda's dissertation considers how musical ability becomes understood as hereditary through sciences such as eugenics, genetics, and physical anthropology.

Dr. Stephanie Pulford is the Center for Educational Effectiveness' Associate Director for Instructional Research and Development. In this capacity, she divides her time between leading CEE's instructional R&D lab group, and supporting the UC Davis' scholarly educators to conduct their own research. Stephanie's disciplinary background is in mechanical engineering. Her current research portfolio broadly includes student/educator learning



experiences and psychology, design thinking in faculty development and SOTL, and the development of practical means to support the growth of the community of scholarly educators and evidence-based teaching practitioners at UC Davis.

## Resource Tables

## IRB Table/booth

Marisol Quintana and Jessica Ramirez  
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### **Purpose**

Two analysts from the IRB will be present to answer questions on submitting to the IRB (i.e., submission and review process).

### **Relevance and Takeaways**

Faculty/Staff/Students can ask questions related to the IRB submission process, the requirements, when they need to submit, etc...

### **Author Biographies**

Marisol Quintana, MA, CIP (Analyst/IRB Member) - Marisol's main role at the IRB is to review social/behavioral/educational research protocols that are no greater than minimal risk. Marisol has been with the IRB Administration for over 6 years, and an employee of UC Davis since 2005.

Jessica Ramirez, MA, CIP (Analyst/IRB Member) - Jessica's main role at the IRB is to review social/behavioral/educational research protocols that are no greater than minimal risk. Jessica has been with the IRB Administration for over 6 years, and an employee of UC Davis since 2010.

## Teaching Undergraduate Science (TUS): a graduate student pedagogy training program in the College of Biological Sciences

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### **Purpose**

Graduate students represent our future leaders in higher education; however, the presence of structured pedagogical training in traditional graduate programs varies widely across institutions, with many lacking any structured discipline-specific pedagogy training. To address the expressed need for pedagogical graduate training, the College of Biological Sciences is developing the Teaching Undergraduate Science (TUS) Graduate Academic Certificate Program. The goal of the program is to provide training in evidence-based teaching practices and mentored authentic teaching experiences to graduate students who are interested in teaching careers. The program would prepare graduate students for successful careers in higher education and better position them to positively impact future retention and success of a diverse STEM workforce.

### **Main Findings**

An online poll of graduate students in the College of Biological Sciences indicated that over 50% of graduate students in biology have an interest in teaching after earning their PhD, yet 72% of students reported they had no teacher training beyond the required one-day UC Davis Teaching Assistant Orientation (n=184 students; November 2015). Surprisingly, 80% of students reported an interest in participating in a structured pedagogy training program. In response to this expressed demand, development is underway for a graduate academic program that provides graduate students with discipline-specific formal training in evidence-based teaching as well as mentored authentic teaching experiences.

### **Description**

The proposed Teaching Undergraduate Sciences (TUS) Graduate Academic Certificate program is modeled after other successful graduate student teacher training programs at R1 institutions. The TUS program is comprised of 12-units of graduate level pedagogy coursework. The core formal pedagogy course is based on the Handelsman et. al. Scientific Teaching text, a widely-implemented guide of faculty teaching professional development programs nationwide. Our 10-week course covers topics spanning the theory of how people learn and backwards curricular design to effective teaching strategies that promote inclusion and equity in undergraduate classrooms. The capstone component of the program is a variable-unit teaching practicum course which requires students to fulfill an authentic teaching experience encompassing all aspects of curriculum development, presentation, assessment, and evaluation inherent to teaching a college-level course. This teaching experience is paired with mentorship to promote reflection and improvement of teaching practices. In addition to these core components, the TUS program includes seminar courses on the scholarship of teaching and learning and developing a competitive teaching portfolio. The program is currently under review with the goal of enrolling the first class in Fall of 2018.

### **Relevance and Takeaways**

The TUS program will not only prepare graduate students to be competitive for various teaching positions, but integration of TUS students in undergraduate courses has the potential to promote awareness and disseminate expertise in effective teaching practices across the undergraduate curriculum. The program was designed to serve as a model that could be easily adapted and implemented in other graduate disciplines across campus. We encourage colleagues to consider whether graduate students in their discipline would be interested in and benefit from a discipline-specific pedagogy training program.

### **Author Biographies**

Dr. Marina Crowder is Teaching Faculty in the Molecular and Cellular Biology Department. In addition to teaching majors and non-majors undergraduate courses in genetics, she is interested in structures to better support the learning and success of transfer students and other underserved students in the upper-division curriculum. She is

also interested in graduate student teaching professional development. Prior to joining UC Davis, Marina taught at Laney Community College and was a postdoctoral fellow at UC Berkeley. She received her doctoral degree in Biochemistry, Molecular, Cellular and Developmental Biology and B.S. degree in Genetics, both from UC Davis.

Dr. Mona Monfared is a Lecturer PSOE in the Molecular and Cellular Biology Dept. She teaches BIS102: Structure and Function of Biomolecules and BIS103: Bioenergetics and Metabolism. She received her PhD in Biochemistry and Molecular Biology at UC Davis and did postdoctoral research at the Plant Gene Expression Center at UC Berkeley/USDA. She has been a faculty member of Santa Clara University, St. Mary's College, Holy Names College, and UC Berkeley Extension.

## Peers explaining to Peers-Student engagement in large undergraduate classes (WORK IN PROGRESS)

Kristin Kiesel

Agricultural and Resource Economics

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### **Purpose**

Learning is not a spectator sport. But how can we actively engage students in large undergraduate classes while covering a wide array of topics? ARE 100B (Intermediate Microeconomics) exposes students to a comprehensive list of economic concepts that go beyond competitive markets and its desirable properties. In trying to convince students that economic theory is not just a dry mathematical exercise, I continue to explore ways to allow students to engage with the material more deeply and arrive at their own conclusions. I have redesigned this course by adding a group project (OPEC game) as an assignment that students need to complete with throughout the quarter. I have further:

- 1) Introduced a student response system to increase student engagement in lectures.
- 2) Created short videos allowing students to review key concepts before and after lectures.

All of these components aim at supporting peer interactions as opportunities to learn from each other. The OPEC game requires students to discuss and submit production quantities in groups throughout the quarter. The highest weight in terms of grading is placed on a memo submitted at the end of the quarter in which students reflect on their strategies and possible alternative approaches, they could have taken. In responding to clicker questions, students are encouraged to discuss with their neighbors before submitting an answer. Finally, the videos feature students, trying to empower other students to explain key concepts in their own words.

I implemented these components with the help of new technologies to improve my teaching effectiveness and use of lecture time. Introducing these components sequentially over several quarters allows me to assess the effect on student engagement, and ultimately learning outcomes, while paying particular attention to potential synergies and reinforcement of ideas across components.

### **Main Findings**

A clear upward trend in student evaluations and appreciation of the added components can be detected. Introducing the student response system had a significant effect on student lecture attendance, as well as on student engagement. The availability of videos further improved the effectiveness of my teaching approach in general, and the OPEC game in particular, as measured both in survey responses as well as individual and aggregated exam performances.

### **Description**

All components are supported by new technologies (e.g. iclickers and the iclicker app, learning glass) and introduced sequentially to allow evaluating the impact on student engagement and learning outcomes. The use of iclickers allows tracking attendance. Videos are posted on Aggie Video and assessable via a canvas page to measure student views for each quarter. To date, the analysis relies on student comments, summary statistics and a graphical analysis. A more detailed analysis that measures the effect of increased lecture attendance on learning outcomes is underway.

### **Relevance and Takeaways**

This project aims at evaluating my own approaches and efforts adapted to large undergraduate classrooms. The careful design, qualitative and quantitative assessment has allowed me to address student needs and improve my teaching effectiveness. It can provide important insights for other faculty wishing to implement active and team-based learning components in large enrollment classes.

### **Author Biographies**

Kristin Kiesel is a lecturer with Potential for Security of Employment (PSOE) in the Department of Agricultural and Resource Economics. Her vision for education is student centered and requires a transition from an instructional

to a learning paradigm. She strives to empower students to think critically and creatively about the economic, social, and environmental challenges of our times in an interactive learning environment that extends beyond the classroom.

## Resource Table: Just-in-Time Teaching Resources

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### **Purpose**

CEE has developed a number of "just-in-time" teaching (JiTT) resources to help instructors learn more about a number of relevant topics related to learning and teaching at UC Davis.

### **Main Findings**

The JiTT resources are research based and are designed to give instructors a "snapshot" of a teaching topic. The JiTT resources also provide strategies to address each topic.

### **Description**

We propose to have printed resources as well as a laptop/monitor to show participants the JiTT resource on the CEE website.

### **Relevance and Takeaways**

We hope that participants will review our resources, consider the content, implement (as appropriate), and engage CEE in further conversation about the resources.

### **Author Biographies**

Kem Saichaie is Associate Director of the Center for Education Effectiveness (CEE) and a Lecturer in the School of Education at the University of California, Davis. He leads the Learning and Teaching Support unit in CEE. His experience in higher education includes roles as a faculty member, and in academic technology, admissions, evaluation and research, and instructional development. Kem has published in a variety of outlets including, *The Journal of Higher Education*, *International Journal for the Scholarship of Teaching and Learning*, and *New Directions in Institutional Research*. He is the co-author of *A Guide to Teaching in Active Learning Classrooms: History, Research and Practice*.

Stacy Wittstock is a graduate student in the School of Education at the University of California, Davis. She is currently completing a PhD in Education with an emphasis in Learning and Mind Sciences, and a designated emphasis in Writing, Rhetoric, and Composition Studies through the University Writing Program. Stacy has taught university-level writing and composition for over six years, and was the coordinator of a writing support program at Washington State University before coming to UC Davis. She has also presented at numerous local and national conferences in the fields of Education, English, and Rhetoric & Composition. Her research interests include peer response, the use of digital tools with composition pedagogies, and both classroom and programmatic writing assessment.



## Taking the Temperature: Using Top Hat Classroom Software in Large Format Classrooms

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### **Purpose**

My presentation will show how I have used Top Hat software in my 150-student Social Problems course. I will share two or three in-class exercises that highlight the ability for Top Hat to engage large classrooms and allow students to see what their peers think and how their collective opinions compare to larger public opinion surveys.

### **Main Findings**

I have not yet processed the data that Top Hat generated from my courses, but will use actual student survey and short answer answers in my presentation. Each of my exercises have shown students how unique their age, geographic, and educational level cohort is, compared to the general American public. In terms of social science courses, this approach can be a useful way to introduce students to methodological considerations of measurement, sampling, and extrapolation.

### **Description**

I plan on doing demonstration of my in-class exercises and will propose some alternative ways that Top Hat software can be utilized. I will have audience members use the software so that they see the functionality from the student's point of view, and then will show how I (the instructor) analyzes the data to make a larger pedagogical point.

### **Relevance and Takeaways**

My presentation is especially useful for large (100-plus) social science or humanities classes. These formats do not lend themselves to individual student participation and Top Hat software allows for all students, especially those who are hesitant about speaking in a large classroom, to participate and actively engage with in-class material.

### **Author Biographies**

Dr. Sacha is a postdoctoral fellow in the Sociology department at UC Davis. He received his PhD in Sociology from the University of Southern California, where he was a Haynes Doctoral Dissertation Fellow and won the College's Outstanding Teaching Award. Dr. Sacha's research focuses on the relationship between social inequality and the high school-to-young adulthood transition for young men. Dr. Sacha's dissertation, "Life on the Sidelines: The Academic, Social, and Disciplinary Impacts of Male High School Sports Participation in California," used original survey and interview data to explore male student-athletes at three Los Angeles high schools.

## Co-Creating Classroom Agreements: Resources and Tips from Lessons Learned

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### **Purpose**

This interactive session seeks to stimulate discussion about the 'how' and 'why' of negotiated classroom agreements. Using narratives drawn from personal experience at a UC Davis TA, as well as materials and practices developed by the presenter, the work aims to provide teachers, researchers, and teacher learners with practical resources that can be used to design and implement student-teacher negotiated classroom agreements.

### **Main Findings**

The presenter will share some of the success, challenges, and lessons learned from implementing a series of negotiated classroom agreements in a section of a lower division UCD Communications course. Over the 10 week course, a series of potential best practices emerged. These include:

- 1) scaffold purpose and effectiveness of co-creating agreements
- 2) include student perspectives in the discussion from day one
- 3) actively engage students about the agreements throughout the duration of the course
- 4) end the course with a debrief and review of the agreements

### **Description**

The session will begin with a brief personal narrative of how the presenter chose to implement co-created classroom agreements in a section of a UC Davis undergraduate course. Then, the presenter will provide materials and lesson plans that were used in the classroom. An interactive discussion about how and why these materials were used will follow. Finally, the session will end with an extended discussion about which of the methods and materials were effective and which were not. Quotes from student course evaluations will be included in order to ensure that there is a student perspective at all times.

### **Relevance and Takeaways**

There are two major goals for this interactive resource session. The first is to share practical materials and advice with teachers about how and why to implement co-constructed classroom agreements. The second is to generate a discussion which leverages the 'knowledge in the room' to share best practices, talk through past experiences, and suggest possible ways forward. It is hoped that this session will reflect the collaborative nature of student-teacher negotiation, wherein shared knowledge is co-constructed to be greater than the sum of its parts.

### **Author Biographies**

Jeff Moran is a Linguistics PhD student at UC Davis where he is researching second-language literacy skills of university-level students, paying particularly close attention to the intersection of language teaching and social justice work. He earned an MA TESOL from the University of San Francisco and currently teaches L2 writing at the College of Alameda and Berkeley City College. In 2015, he received a Fulbright ETA grant, which allowed him to teach English at the Universidad de Cartagena, Colombia. His life's passion is to empower students to use the funds knowledge that they bring into the room in order to grow personally and academically.

## Combining experiments with the theory in the class room for manufacturing and aerodynamics

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### **Purpose**

We want to demonstrate that combining experimental tools with theory for lectures helps the students to understand both of them better and appreciate the connections, especially if the experiment is cheap and easy for the students to play with and fast turnaround. Our example is design and manufacturing of airfoil and nozzle models to experience the influence of model shape, roughness and edge sharpness in a water table experiment.

### **Main Findings**

A first undergraduate course offering was conducted in SQ17 to 36 students. The course feedback was very positive. The students appreciated the hands-on projects. Their final presentations were professional.

### **Description**

We want to demonstrate the water table experiment and manufactured parts in the format of a Resource Table. We will bring the lecture material as print-outs and present on course assessment from surveys.

### **Relevance and Takeaways**

Combining affordable, hands-on experiments and theory is essential for the educational process in engineering courses.

### **Author Biographies**

Barbara Linke got her Diploma (2002) and doctorate (2007) in mechanical engineering at the RWTH Aachen University, Germany. She worked with Prof. Fritz Klocke at the Laboratory for Machine Tools and Production Engineering WZL at RWTH Aachen University from 2002 – 2010. From 2010 - 2012, Barbara was a research fellow at the University of California Berkeley at Prof. David Dornfeld's laboratory. Since November 2012, Barbara has been an assistant professor at the University of California Davis. In 2015, she finished her Habilitation at the RWTH Aachen University.

M. Hafez received his PH.D. from University of Southern California, Department of Aerospace Engineering in 1972. Then he worked at Flow Research Inc., in Kent Washington and at NASA Langley Research Center in Hampton Virginia, before he joined University of California, Davis in 1985 as a Professor of Aeronautical Engineering. His fields of interest are transonic aerodynamics, Computational Fluid Dynamics (CFD), and STEM Education.

## Guided Collaboration: Encouraging Student Agency and Reflection in Writing

Bridget Mabunga, Ariel Loring, Heather Sturman

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### **Purpose**

As Writing Specialists in the SASC, we have observed gaps between students' writing competencies and instructors' writing expectations. To address these gaps and because our data show that meeting with us at least 8 times per year improves students success, we have developed support classes that employ peer review and discipline-specific lesson plans. Our peer review materials aim to teach effective peer review strategies that move beyond grammar correction and lead students to better assess their own writing and that of their peers. Our discipline-specific writing materials are scaffolded to support students as they improve communication in their respective fields.

### **Main Findings**

Students benefited from having agency in our instructor-guided activities as evidenced by their high engagement and improvement in writing ability. During peer review, we found that requiring students to choose a workshop topic and guiding students with giving appropriate feedback taught them how to assess writing and revise their own work. The discipline-specific writing tasks taught students how to effectively communicate in their field of study, thereby increasing their confidence and understanding of their field. Our reflections and observations indicated our activities promoted student growth and were directly relevant to students' writing in other classes.

### **Description**

Our proposed resource table is designed for those who assign writing but struggle to teach it across the curriculum. We will provide resources to demonstrate peer review and discipline-specific writing materials for audiences to adapt for use in their own instruction. We will share our peer review workshop handbook that has been employed and adapted in 6 classes in 2017. The handbook includes practice activities in giving relevant feedback; tasks for the assigned writer before, during, and after class; and workshop options, which give writers agency in selecting questions their peers will address. As reflection and assessment are also key components, we will describe the strategies and share the handouts we used to hold students accountable to themselves and their classroom community. Handouts will be provided for the four discipline-specific writing tasks, which ask students to explain a concept from their field of study to a layperson, take detailed notes of a class lesson, demonstrate a process from their field of study, and craft a formal, substantive email to a professor. These tasks require students to consider their audience and practice writing about potentially difficult concepts in their discipline with increasing complexity.

### **Relevance and Takeaways**

Our presentation provides best practices for teaching peer review and writing in the disciplines. We will share collaborative, adaptable activities for instructors who want to include discipline-specific writing and peer review in their courses, either in full or piecemeal. As instructors, it is important for us to ensure students possess appropriate academic literacy in their discipline, so our writing tasks encourage genre and audience awareness when writing in these fields. Furthermore, as ample research supports clearly structured peer review and teaching students to give feedback, we intend to reshape instructor and student perspectives of peer review.

### **Author Biographies**

Ariel Loring is a Writing Specialist in the Student Academic Success Center where she teaches classes and workshops in writing support, summer bridge, and tutor training, and works with students one-on-one to improve their writing. She has a Ph.D. in linguistics from UC Davis and conducts research in the areas of language discrimination, discourse analysis, and citizenship policies. She also holds a lectureship position at CSU Sacramento, where she has been teaching a linguistic anthropology course for the last 3 years.

Bridget Mabunga, a Writing Specialist in the Student Academic Center, has taught college writing in the Sacramento area for ten years. At UC Davis, she offers individual meetings, in-class writing workshops, small group co-workshops, and summer bridge classes to support undergraduate writers at all skill levels while emphasizing writing as a process. She also co-designs/facilitates writing tutor training, focusing on mentoring tutors as they develop their teaching pedagogy. She holds an M.A. in English with an emphasis on Creative Writing from CSU, Sacramento and is currently working on two novel manuscripts.

Heather Sturman has been an English Language Learner Specialist at the Student Academic Center since 2013. She works with students individually and teaches writing and grammar support classes during the school year and in summer bridge programming to help students improve their writing. She also assists with designing and implementing writing tutor training, teaching best practices. Previously, she taught grammar and writing courses at the UC Davis Extension intensive English program and in the Linguistics Department. She holds a Ph.D. in linguistics from UC Davis with a focus on second language acquisition, sociolinguistics, and teaching English language learners.

## Using the eXperience API to Examine Nursing Student Clinical Thinking Skills

Andrew Corbett

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### Purpose

The Betty Irene Moore School of Nursing has deployed "virtual patient" experiences in its curriculum to enhance and understand students' clinical reasoning skills. These interactive, online experiences involve gathering information about a patient, evaluating the significance of that information, and making sound clinical decisions using that information. By using the eXperience API within these interactive modules we have been able to collect and analyze students' actions and choices within these virtual patient experiences.

### Main Findings

By analyzing the data collected via xAPI we are able to examine students' thinking at a fine-grained conceptual level. As an example, the most critical finding for one of the virtual patients was an elevated blood pressure while sitting which dropped significantly upon standing. This finding is suggestive of sepsis and means the patient requires immediate hospitalization and aggressive treatment. While about half of students correctly flagged this blood pressure result as significant, these students were no more likely than others to immediately hospitalize this patient. In other words, recognizing a significant finding did not necessarily translate into making the correct clinical decision based on that finding. We are just beginning to harness the potential of this approach to inform and improve instruction.

### Description

We propose to provide a Resource Table for SOTL Conference participants. Information and resources provided will include:

- 1) A quick overview of our work and results
- 2) A primer on the eXperience API and how it works
- 3) An overview of how we implemented xAPI in our interactive modules
- 4) A discussion of the challenges we encountered and future plans for improvements
- 5) A handout with a summary of xAPI and resources to explore for future reference

### Relevance and Takeaways

xAPI provides an open-source technology for collecting fine-grained data on students' behaviors and choices within interactive learning environments. Analyzing the collected data provides the opportunity to understand students' understanding of difficult concepts at a deep and detailed level. For those courses that present barriers to student success, using xAPI can provide UC Davis educators with a powerful tool to identify the critical concepts that challenge students and develop ways to improve student understanding of these concepts.

### Author Biographies

Andrew Corbett is an education technologist at the Betty Irene Moore School of Nursing at UC Davis. He supports the school's instructional innovation efforts including case-based learning, interactive online content, learning analytics and associated computing infrastructure. Prior to joining the School of Nursing, he developed simulation-based e-learning for veterinary continuing education and for undergraduate science education. Corbett earned a Doctor of Philosophy in Ecology from UC Davis with a focus on simulation of biological systems.

## Learning Outcomes for Information Literacy

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### Purpose

Information literacy is a “set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning”. UC Davis librarians recently developed learning outcomes for information literacy with the purpose of collaborating with teaching faculty to integrate the outcomes into courses and assignments. These outcomes support the Library’s stated goal to identify and implement assessment methods that document the positive impact on student success of using sophisticated information discovery strategies. The Framework for Information Literacy in Higher Education both defines information literacy and provides the theoretical basis for these outcomes.

Association of College and Research Libraries. (2016). *Framework for Information Literacy in Higher Education*. Retrieved from <http://www.ala.org/acrl/standards/ilframework>

### Main Findings

Our information literacy outcomes are a tool that librarians and faculty can use to articulate and assess students’ abilities to think critically about information and use it effectively.

### Description

Participants will be introduced to the Framework so they will be able to discuss and evaluate the potential usefulness of the information literacy outcomes in the context of their courses and assignments. We will also explore the idea of threshold concepts, developed by Jan Meyer and Ray Land, who defined these concepts as the “core ideas and processes in a discipline that students need to grasp in order to progress in their learning, but that are often unspoken or unrecognized by expert practitioners”. Do the information literacy learning outcomes address what students need to grasp or be able to do in order discover and use information effectively?

Meyer, J., & Land, R. (2003). *Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines*. (ETL Project Occasional Report 4). Edinburgh: Enhancing Teaching-Learning Environments in Undergraduate Courses Project. Retrieved from [https://www.colorado.edu/ftcp/sites/default/files/attached-files/meyer\\_and\\_land\\_-\\_threshold\\_concepts.pdf](https://www.colorado.edu/ftcp/sites/default/files/attached-files/meyer_and_land_-_threshold_concepts.pdf)

Townsend, L., Hofer, A., Lin Hanick, S., & Brunetti, K. (2016). Identifying Threshold Concepts for Information Literacy: A Delphi Study. *Communications in Information Literacy*, 10(1). Retrieved from <http://comminfolit.org/index.php?journal=cil&page=article&op=view&path%5B%5D=v10i1p23>

### Relevance and Takeaways

Participants will leave with practical set of learning outcomes that can be used to introduce or reinforce with students the various abilities needed to discover, critically evaluate and use information to research, create, and participate in the development of new knowledge. They will gain an understanding of threshold concepts that could be useful for thinking about the organization of disciplinary knowledge and for reflecting on their own course content.

Swanson, T. (2017). Sharing the ACRL Framework with faculty: Opening campus conversations. *College & Research Libraries News*, 78(1), 12-48. <https://doi.org/10.5860/crln.78.1.9600>

### **Author Biographies**

Alesia McManus is an Associate Librarian at UC Davis Library. She is lead for library instructional services and provides research support and consultation to environmental sciences students, faculty, and staff.

Melissa Browne is the librarian subject liaison for education, psychology, human development and family studies at the UC Davis Library. She teaches information literacy classes and provides individualized research support.



## The Undergraduate Research Center

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### **Purpose**

The Undergraduate Research Center (URC) assists faculty members in supporting students in undergraduate research and research-related opportunities (workshops, conferences, publishing, travel awards, student grants). We inspire and facilitate students' engagement in research, scholarship and creative activities in all disciplines. We empower students to find research opportunities with UC Davis faculty, and provide them with resources to hone skills that are vital to success as researchers and in their future careers

### **Main Findings**

Undergraduate research at UC Davis inherently involves faculty sponsors and faculty engagement to maintain academic rigor. Undergraduate research is recognized as a high-impact educational practice, which emphasizes the academic rigor (Kuh, 2008). The definition of Undergraduate Research according to the Council of Undergraduate Research (CUR) is "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline." [The Council on Undergraduate Research, founded in 1978, is a national organization of individual and institutional members representing more than 900 colleges and universities (<http://www.cur.org>).] Undergraduate research involves students with faculty members' own research where there is an emphasis on critical inquiry, frequent writing, information literacy, collaborative learning, and other skills that develop students' intellectual and practical competencies. Students are involved with contested or cutting-edge questions in scholarship, empirical observation, cutting-edge technologies, and the sense of excitement that comes from working to answer important questions.

### **Description**

We have printed resources readily available that summarize URC services. Both the Director and Associate Director will be on hand to answer questions and highlight programs and opportunities.

### **Relevance and Takeaways**

We hope that participants will review our resources, consider the content, be encouraged to engage undergraduate student in research and discovery processes, have a better understanding of how the URC supports faculty members who have students conducting research with them, and engage with the URC in further conversations. In particular, we hope to help faculty know about opportunities for their students to enroll for academic credit and apply for the Provost's Undergraduate Fellowships (PUF), travel awards, and Chancellor's award, as well as other special research programs available on campus.

### **Author Biographies**

Annaliese Franz is an Associate Professor of Chemistry and also serves as the Faculty Director of the Undergraduate Research Center (URC) at the University of California, Davis. She is the current Director/PI of the NSF ChemEnergy REU program at UC Davis,

Tammy Hoyer is the Associate Director of the Undergraduate Research Center (URC) at the University of California, Davis. Additionally, Tammy serves as the Chair of the Undergraduate Research, Scholarship & Creative Activities Conference held annually on campus.

## Teaching Assistant Consultant Program Resource Table

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### **Purpose**

A resource table providing information on the TAC program. One or two TACCs/TACs will staff the table to respond to questions about the TAC program and provide further information about our services.

### **Author Biographies**

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PhD Candidate in Political Science