Center for Academic Innovation

SAGINAW VALLEY STATE UNIVERSITY

TEACHING & LEARNING SYMPOSIUM

FEBRUARY 19, 2016

INNOVATE COLLABORATE CONNECT

THE CENTER FOR ACADEMIC INNOVATION

Dr. Poonam Kumar	Director, Center for Academic Innovation and Online Learning
Dr. Robert Lane	Professor, Department of Political Science
Dr. Erik Trump	Professor, Department of Political Science
Dr. Josh Ode	Associate Vice President for Community Engagement & Integrated Learning.
Ann Coburn-Collins	Director, Academic Programs Support

Welcome to the Center for Academic Innovation's (CAI) 2nd Teaching Symposium. The Center's mission is to support the campus community in enhancing and creating innovative practices that advance pedagogical excellence and support the University's commitment to teaching. We hope this Symposium will provide you with a platform for discussions on teaching and learning issues and inspire you to try new pedagogies. We plan to do this in the following ways: First, we have the privilege of having Dr. Kenn Barron present the Keynote Speech, and the subsequent workshop. Dr. Barron is Professor of Psychology at James Madison University and co-coordinator of the Motivation Research Institute. His research focuses on motivation and achievement in academic, sport, and work settings. Second, in three consecutive Showcases, ten SVSU faculty, including the 2015-2016 recipients of the Herbert H. and Grace A. Dow Professor Award, will showcase the creative work they are currently implementing in their classes. Finally, following this symposium, the CAI team looks forward to continuing the conversations and collaborating on creating engaging learning experiences using promising pedagogical practices.

- CAI Team

INNOVATE **COLLABORATE** **CONNECT**

SAGINAW VALLEY STATE UNIVERSITY

KEYNOTE SPEAKER

Dr. Kenn E. Barron
James Madison University
Professor of Psychology

Dr. Kenn Barron is a professor of psychology at James Madison University and co-director of the Motivation Research Institute. He started working at JMU in 2000 after receiving his PhD in social/personality psychology from the University of Wisconsin-Madison. Kenn regularly presents and publishes on topics related to motivation and the scholarship of teaching and learning (SoTL), and teaches courses in research methods, statistics, and motivation. He also strives to put his knowledge of motivation into practice by coordinating JMU's Psychology Learning Community (PLC). Throughout his career, Kenn has been recognized with numerous teaching, research, service, and advising awards. For example, in 2012, he was named a fellow of the American Psychological Association and one of Princeton Review's Top 300 professors in America.

Keynote Address Breakfast: 9:00 - 10:30 A.M.

Is There a Formula to Help Understand and Improve Student Motivation?

Dr. Kenn Barron will introduce a single motivation formula to help you quickly understand the major sources of student motivation and share evidence-based practices that promote each source of motivation. Then, he will discuss how the motivation formula and practices can be applied to improve student motivation in courses, majors, and other curricular/co-curricular programs at SVSU. Finally, he will emphasize the need to assess student motivation to help guide and evaluate your efforts.

Workshop: 10:40 - 11:50 A.M.

Practicing How to Use and Apply a Formula for Student Motivation

Join Dr. Kenn Barron to continue the conversation started during the Breakfast Keynote. In this hands-on workshop, we will practice applying the formula for student motivation. First, you will use the formula and list of evidence-based practices from the keynote to evaluate a case study of an instructor trying to improve motivation. Then you will apply the formula to your own experiences working with students at SVSU. For example, if you are a faculty member, you will be asked to reflect on one of your courses to consider how you currently promote student motivation and how the formula can be used in your daily syllabus planning to improve motivation. If you are an administrator or staff of a program, you will be asked to reflect on how your program is currently designed to optimally motivate students.

SAGINAW VALLEY STATE UNIVERSITY

Keynote Breakfast: *Is There a Formula To Help Understand and Improve Student Motivation?*

9:00 - 10:30 A.M.
Seminar D & E

Workshop: *Practicing How to Use and Apply a Formula for Student Motivation*

10:40 - 11:50 A.M.
Seminar F

Deli Luncheon

12:00 - 12:50 P.M.
Seminar D & E

Showcase I

1:00 - 1:50 P.M.
Seminar F

James Bowers,
Use of iPads to Support Group Work in the Classroom

Jennifer Chaytor,
Development of Online Pre-Laboratory Activities in Organic Chemistry

J. Blake Johnson,
Cardinal Solutions

Showcase II

2:00 - 2:50 P.M.
Seminar G

Averetta Lewis & Kathleen Schachman,
Using Digital Standardized Patients

Patricia Cavanaugh,
The Post-Apocalyptic Writing Project

Phillip Hanson,
Incorporating Reflective Blogs in Coursework to Aid in Learning and Retention

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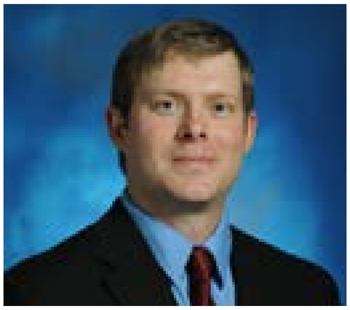
Showcase III

3:00 - 3:50 P.M.
Seminar F

Dustin Spencer,
Flipped Classroom Implementation in a BSN Curriculum

Chris Nakamura,
Laboratory Activities for Enhancing an Upper-division Lasers Course

Heather Kanicki,
Playing to Learn: Active Learning that Engages Students



Use of iPads to Support Group Work in the Classroom

James Bowers
Assistant Professor
Department of Criminal Justice

James Bowers is an assistant professor of criminal justice at SVSU. His research interests include crime mapping, online teaching presence and engagement, testing criminology theory, and program analysis. He has co-authored journal articles in the International *Journal of Web-Based Learning and Teaching Technologies, Journal of Crime and Justice, Justice Policy Journal, Criminal Justice Policy Review, Western Criminology Review,* and *Journal of Offender Rehabilitation.*

Abstract

iPads and other electronic devices are increasingly utilized in college classrooms, but most students who own iPads do not use them for educational purposes (Lindsay, 2011). This study is an exploratory study examining student perceptions about iPad use in the classrooms with group work and the possible impact on student grades. Two sections of an upper-level course (CJ 401 Issues and Policies) were used as the experimental (used the iPads for group work) and the control group (paper and pencil group work). Preliminary results show that students have positive feedback regarding the iPad use and the iPad group has had the same or better test scores as the pen and paper group.

Instructional Challenge

There is a paucity of research that involves iPad technology in the classroom with the Canvas application targeting retention of the course material learned (Nyugen & Barton, 2014). Instructors are challenged to find new ways of engaging students to retain the information. In terms of the instructional and learning need, there is a need not only to prevent the loss of information but to provide an opportunity for students to become engaged in their learning through technology. When students take notes by hand, information can be lost, misunderstood, or not taken down at all. The lead author noticed that students were not engaging in traditional pen and paper group work.

The idea for this study came about when Jared Stein's (2014) "Lossless Learning General Product Session," and fellow presenters suggested that Canvas might be able to provide faculty with "superpowers" through the use of technology. These powers including tracking performance, grading students in real time, and engaging students in new ways. That presentation is the basis for the current study. Engaging students can be challenging and it was thought that technology could be used to keep students focused on the task at hand.

Teaching Innovation

The researcher had access to two sections of the same criminal justice course (CJ 401) in Fall semester of 2015; it is from these two classes that the research data was collected. Students in both classes completed group work. Each group was made up of 6 students, whether they were in the iPad class or the traditional class. There were 6 review questions completed on a weekly basis; one question was assigned per group. Before each class started, Canvas automatically assigned the students to their groups in both sections. The questions assigned were called "Putting It All Together" and other essay questions assigned by the instructor (Vito & Maahs, 2011). These questions involved higher level thinking by applying the concepts (Fink, 2003). The iPad group would work on the answers and upload them to a Canvas Discussion forum. The pen and paper group did not use technology.

Impact

To be able to compare these classes, it is essential to ensure the students are similar in terms of demographics. Classes were comparable in terms of demographics (age, class standing, average credits, g.p.a., and gender). The qualitative feedback was positive with students noting, "easy to get others' notes online" and "easy to study from [Because]." you don't have to physically write, "[the note taking is] faster than handwriting, more legible" and "not messy like pen and paper." Group activities made it "fast and easy to acquire information." Student engagement and teamwork was another emerging area. One student argued "engaging" and "teamwork" as a benefit, and another wrote "good group collaboration." Students found the use of iPads, "made group work easier" and "great for starting small group discussions." Another student argued it, "got people involved in the material and opened people up to work with others." The overall sentiment for this question was that "iPads will demand everyone's attention because they are cool and up to date technology. Students would enjoy using them and will be excited to do work on them." The quantitative portions of the survey found that the dimensions of collaboration, review of the material, enjoyment, and ease of use to be the highest ranked. T-tests of student grades show that the iPads class has the same scores statistically or better. The first three quizzes were open-note and show no significant differences between the classes. The last three quizzes were closed-note to measure student retention of the material. The results show significantly higher scores for the iPad group in two of the three closed-note quizzes. The average quiz scores were also compared, with the iPad class scoring significantly higher overall.

References and Resources:

Fink, L. D. (2003). Creating significant learning experiences: An integrated approach to designing college courses. San Francisco: John Wiley & Sons, Inc.

Lindsey, J.L. (2011). Leading change: "going green" with iPads. International Journal of Business, Humanities & Technology.

Nguyen, L., & Barton, S. (2014). IPads in higher education – Hype and hope. British Journal of Educational Technology.

Stein, J. (2014). Lossless Learning General Product Demonstration (Canvas). Retrieved from https://www.youtube.com/watch?v=0Ueo_ATCbrA on January 31st, 2015.

Vito, G.F., & Maahs, J.R. (2011). Criminology: Theory, research, policy (3rd ed.) Jones and Bartlett: Sudbury, MA.

Jennifer Chaytor
Assistant Professor
Department of Chemistry

Jennifer completed a PhD at the University of Ottawa (Ottawa, Ontario, Canada) in 2010. She teaches organic chemistry lectures and laboratories and her research program involves chemical synthesis of compounds that have attractive biological and medicinal applications.

DEVELOPMENT OF ONLINE Pre-Laboratory Activities in Organic Chemistry

Abstract

The goals of this project are to develop online pre-laboratory activities for CHEM 231 (Organic Chemistry I laboratory). The pre-lab lecture, currently presented by the instructor at the beginning of the laboratory session, will be recorded using lecture capture software and posted online for the students to view prior to attending the lab session. Videos describing equipment to be used, common laboratory techniques, and safety concerns will also be developed. Additionally, pre-lab quizzes will be written and posted online on Canvas to be answered by students prior to the lab session. Anticipated outcomes are to improve the students' understanding of the theory and techniques undertaken in lab, decrease their anxiety regarding complex lab procedures, improve their work efficiency during the lab period, and increase consistency of pre-lab lectures across all instructors including adjunct instructors.

Introduction

There is presently a large push to implement the use of technology into science classes. However, it is important that technology be used wisely with consideration of best practices for its use. An emerging pedagogical method is the use of the "flipped classroom", where the traditional "lecture" activities are done at home prior to the class meeting, while the class meeting time is used to solve problems and expand upon the material presented in the lecture materials. An excellent application of this method is in the chemistry laboratory, where students are used to doing some pre-lab preparation at home prior to attending the lab meeting. Unfortunately, many students do not seem to understand the theory behind the experiments and use the lab period to simply "follow the recipe (procedure)" without giving much thought to "why" they are doing certain tasks and how the experiment relates to the information presented in lecture. A "flipped" classroom approach to pre-lab may resolve these problems. Successful models of flipped chemistry laboratories have been reported by Teo et al. and Chittleborough.

Instructional Challenge

Currently, students enrolled in CHEM 231 at SVSU are expected to read the lab manual prior to each laboratory meeting and to complete a short pre-lab exercise, which includes summarizing the procedure in their lab notebook and reviewing safety information and hazards of the chemicals to be used. At the start of each lab session, each instructor gives their own pre-lab lecture reviewing the theory behind the experiments, the equipment and techniques to be used, and relevant safety concerns. These lectures last 0-30 minutes on average depending on the instructor. This pre-lab lecture takes valuable time out of lab and often causes students to rush to complete their experiment in the remaining time. Another concern is the lack of consistency between lectures from different instructors, particularly adjunct instructors who cover many of the laboratory sessions held in the evenings. Additionally, the students often appear to lack understanding of the theory behind the experiments and how they connect to the lecture material, even after they complete the current pre-lab activities.

Teaching Innovation

In this project, the current pre-lab material will be videotaped using Echo 360 lecture-capture software and posted online on Canvas. Students will be expected to watch the video prior to attending the laboratory session. Pre-lab quizzes will also be developed based on the material in the lab manual and pre-lab video and the students will complete these quizzes prior to the laboratory session for| a small percentage of their grade (2-5%). Additional videos reviewing common organic lab equipment and techniques as well as "Frequently Asked Questions" and a review of safety policies will also be developed for the students to view as necessary.

Impact

This project is expected to impact student learning in several important ways. First, it ensures consistency in the pre-lab lecture material across all instructors. It may also help adjunct or part-time instructors to be more confident that they are meeting the learning goals and content requirements set forth in the syllabus. Students will be better able to understand the theory behind the experiment and how each experiment is linked to the content in their associated organic chemistry lecture course. Students will also be able to focus on the technical details of the experiment while understanding the reasoning behind each step in a procedure. This should increase their efficiency and confidence within the lab period. Finally, viewing the important information and lab equipment prior to entering the laboratory should decrease students' anxiety regarding working with expensive and potentially dangerous equipment, glassware, and chemicals, thus reducing lab accidents.

References and Resources:

Chittleborough, G.D., 2007. Achieving greater feedback and flexibility using online pre-laboratory exercises with non-major chemistry students. Journal of Chemical Education, 84, 884-888.

Seery, M.K., 2013, Harnessing Technology in Chemistry Education. New Directions, Vol. 9, Issue 1, doi:10.11120/ndir.2013.00002

Teo, T.W. et al., 2014, How flip teaching supports undergraduate chemistry laboratory learning. Chemistry Education and Research Practice, 15, 550-567.

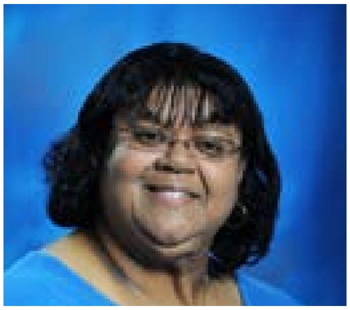
Cardinal
Solutions

J. Blake Johnson
Associate Professor
Department of Art

Blake holds a BFA from The Art Center College of Design and a MFA from The University of Idaho. Prior to teaching design, Blake worked for a number of design firms whose clients included Nike, Disney, Sony, NBC, X-BOX, Oracle, Microsoft, Adidas, and Columbia Sportswear.

Abstract

Cardinal Solutions brings various majors together to work directly with local businesses and non-profits. This group analyzes organizations, determine their weaknesses, and proposes/creates solutions. In many ways this small group of students with varying majors operates as a business, each called upon to offer their expertise in a certain area to insure the success of the project.



Ava Lewis
Professor of Nursing
Department of Nursing

Dr. Lewis is a native of Saginaw. She graduated from SVSU with a degree in sociology, a BSN, MSN, and FNP certification. Her PhD is from Michigan State University with a post-doctoral certificate in rural health from University of New York at Binghamton.

Kathleen Schachman
Harvey Randall Wickes
Endowed Chair in Nursing
Department of Nursing

Her interests include maximizing the use of technology to engage and interact with distance learners.

Using Digital Standardized Patients

Abstract

Diagnostic errors are consistently identified as a prominent cause of preventable morbidity and mortality, and have been targeted by the Institutes of Medicine as "the next frontier for patient safety" (National Academies of Sciences, Engineering, and Medicine, 2015). This project will facilitate the development and refinement of diagnostic reasoning skills in Family Nurse Practitioner (FNP) students through innovative, technology-rich strategies. We will use digital standardized patients to teach and reinforce the collection and analysis of patient data to arrive at accurate medical diagnoses. Through the creation of an online "virtual clinic," FNP students will interact with digital patients to develop and hone interview and examinations skills, judiciously order cost-effective diagnostic testing, and refine cognitive skills that enhance diagnostic reasoning. Outcomes include: diagnostic accuracy, relevance, time on task, self-confidence, adherence to standards of care, cost-effectiveness, and satisfaction.

Introduction

The role of the FNP is to assess, diagnose, and treat chronic and acute illness in individuals across the lifespan. A critical skill that FNP students must acquire during the formal educational process is diagnostic reasoning. Diagnostic reasoning is the process by which medical professionals collect, process, and interpret patient information to formulate a medical diagnosis. Well-honed diagnostic reasoning skills are the cornerstone for safe and quality care; conversely, poorly developed diagnostic reasoning skills and inaccurate diagnoses can lead to costly and potentially harmful tests and interventions, result in delays in necessary treatment, and contribute to patient suffering (Croskerry, 2004). The aim of this project is to facilitate the development and refinement of diagnostic reasoning skills in FNP students through innovative, technology-rich strategies. Specifically, funding for this project has allowed us to use digital standardized patients (DSPs) to teach and reinforce the collection and analysis of patient data to arrive at accurate medical diagnoses.

Instructional Challenge

Largely, the diagnostic reasoning process is a cognitive process. It involves self-communication or an internal dialogue that the student engages in before, during, and after the patient encounter, and as such, is not directly observable for assessment purposes. Often, FNP faculty are confronted with a clinical situation in which the FNP student has clearly missed the mark in terms of diagnosis and management. DSPs provide an ideal environment to indirectly observe and evaluate this process, as faculty are able to monitor the sequence and quality of interactions between the student and the DSPs. Through the use of DSPs, we are able to see where students made a diagnostic error (a cognitive "wrong turn") and can intervene and use this as a teaching point. We plan to leverage the technology of the DSPs to address these teaching challenges.

Teaching Innovation

DSPs are interactive computer simulations of patients in clinical scenarios for purposes of healthcare training, education, or assessment. Benefits of DSP experiences include integrating clinical and communication skills, providing immediately teachable moments not always found in real clinical practice, and providing time for students to reflect on their skills. DSP encounters are adaptable and can be adjusted to meet the needs of the student (from simple to complex) as they progress through the program. These encounters allow for repetition, which allows the student to repeat a task until they achieve competency. Finally, DSPs provide a "safe" environment for students to practice and perfect skills they will use with actual patients. With the use of DSPs, patient care in a clinical setting is not compromised. Clinical errors can be allowed to progress in order to teach students the implications of, and how to correct, the errors.

Impact

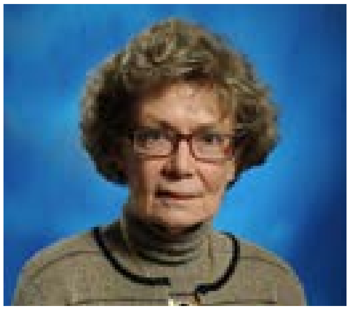
Diagnostic errors are the biggest patient safety and medical malpractice problem in the United States. In a review of U.S. malpractice claim payouts over a 25-year period, diagnostic errors were found to account for the largest fraction of claims, the most severe patient harm, and the highest total of penalty payouts (over $38 billion annually) (Newman-Toker, 2013). Since cognitive "wrong turns" are the prime driver of diagnostic errors, it is critical that we facilitate FNP students' understanding of the diagnostic reasoning process, and recognition of how cognitive biases can contribute to diagnostic error (Croskerry, 2004). The use of DSPs fosters the self-reflective process by forcing the student to examine their reasoning process as they go through the cognitive steps of arriving at a medical diagnosis. It is our belief that diagnostic accuracy, an important goal for patient safety, will be improved through the use of DSPs.

References and Resources:

Croskerry, P. (2004). The importance of cognitive errors in diagnosis and strategies to minimize. Academic Medicine, 78(8), 775-780.

National Academies of Sciences, Engineering, and Medicine. (2015). Improving Diagnosis in Health Care. Washington, DC: The National Academies Press.

Newman-Toker, D.E. (2013). Diagnostic errors more common, costly and harmful than treatment mistakes. Johns Hopkins Medicine, 108(6), 437-442.



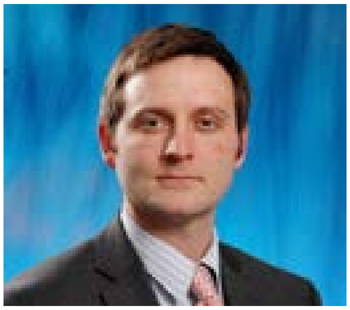
The Post-Apocalyptic Writing Project

Patricia Cavanaugh
Professor of English
Department of English

M.P. Cavanaugh received her PhD from Michigan State University. Her teaching and research interests are in English education and composition. One of her teaching goals is to help make her students think of themselves as writers.

Abstract

The Post-Apocalyptic Writing Project began as a collaboration between an English professor and a chemistry professor. It has grown to include ten faculty members. The project takes place in ENGL 482: Methods of Teaching English. Faculty from Physics, Chemistry, Computer Science, Political Science, English, Sociology, and Criminal Justice either advise or come to the class to give mini-lectures on a variety of topics: radiation, asteroids, sun spots, artificial intelligence, building up a new civilization, zombies, and how to write in post-apocalyptic genre. Students in the class then write post-apocalyptic short stories. These stories will be developed into a book in print and posted on the university writing programs' website.



Phillip Hanson
Assistant Professor
Department of Art

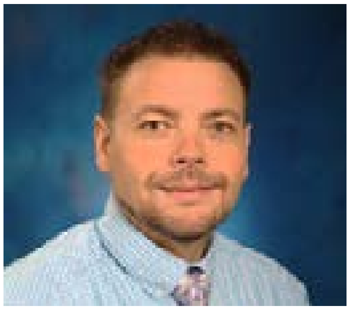
Phillip teaches the core foundation art classes of 2D Design, 3D Design, and Introduction to Drawing. He has his MFA from The Ohio State University. His work is held in public and private collections in the U.S. and abroad. Phillip's research is concerned with the interaction between digital and analog methods of image making.

Incorporating Reflective Blogs in Coursework

To Aid in Learning and Retention

Abstract

The current generation of students are digital natives with the general tendency to want to share what they know and who they are with others. In light of that I use blogs and e-portfolios as a means for students to both communicate their understanding of course content and share their creative work. In the symposium presentation I will show examples of student blogs and discuss some of the benefits and challenges of using blogs and e-portfolios as a teaching tool.



Dustin Spencer
Assistant Professor
Department of Nursing

Dustin is a certified emergency nurse with level 2 trauma center experience and more than 9 years of EMS clinical and educator experience. He is flexible and skilled in assessing, developing and implementing student centered lesson plans, programs and remediation.

Flipped Classroom Implementation in a BSN Curriculum

Abstract

The "flipped classroom" model is an innovative teaching strategy that has been shown in literature to promote educational excellence in nursing through increased knowledge retention, critical thinking, and clinical judgement. The flipped classroom model has been implemented in the bachelorette nursing program by Dustin Spencer DNP, Suzanne Savoy PhD, and Cynthia Hupert, MSN. This innovative model utilizes the evidence-based delivery of instructional materials prior to class, with active participation from students in class through problem and team based learning activities. These activities are designed to promote enhanced learning. Undergraduate nursing students in the first and second semesters will be the target population with the anticipated goals of increasing long-term retention of key concepts and fostering lifelong learning skills and sound clinical judgement. The results have been promising in regards to student learning outcomes, though mixed in regards to student engagement and satisfaction.

Instructional Challenge

In the undergraduate nursing program there is a perceived need among the faculty that students increase knowledge retention of content learned in the beginning semesters of the nursing program. This need has been further reinforced by an outside consultant whose evaluation of recent graduates showed lack of knowledge retention through score results on a comprehensive standardized test. This lack of knowledge retention is of great concern as the health care environment continues to increase in complexity. The knowledge that is required to practice safe patient care progresses from the foundational learning that occurs during the early semesters of the program. During their careers as professional nurses these students will be required to utilize lifelong learning skills to adapt the ever-changing healthcare environment. Traditionally, educators utilize a more passive pedagogical method that is instructor-centered through lectures and dependent student learning (Schlairet, Green and Benton, 2014). Towle and Breda (2014) identified that educators continue to put emphasis on skills, content, safety, and educational requirements to successfully pass the National Council Licensure Examination for Registered Nurses (NCLEX), allowing for minimal opportunities to apply critical thinking and clinical judgement. Although this method has been determined to be successful is transferring knowledge to students, the flipped classroom model represents a student-centered approach, including active learning and participation. The flipped classroom model has been shown to have effective learning outcomes in knowledge retention, critical thinking, and clinical judgement for students through the implementation of classroom activities including case studies, concept maps, role-playing, simulation, and innovative quizzing (Schlairet et al., 2014).

Teaching Innovation

Literature has identified successful outcomes as a result of the flipped classroom model. According to Schlairet et al. (2014), the flipped classroom model supports independent, self-directed student learning that promotes successful critical thinking skills. In addition, Towle and Breda (2014) discuss the significant value in the flipped classroom as it relates to increased knowledge retention, superior learning outcomes, and improved critical thinking and clinical judgement. These findings are of significant value to the profession of nursing as students often graduate lacking the ability to critically think and use appropriate clinical judgement in the workplace. As nurses are at the forefront of patient care, lacking the critical thinking and clinical judgement ultimately places patient safety at risk.

Through the implementation of the flipped classroom model, students will become active participants in their own learning. Through faculty integration of curricular and co-curricular activities, there is an increase in student engagement with the content through technology, problem and team based learning activities. This engagement increases student success and knowledge retention. Students will utilize interactive pre-class and in-classroom activities and contribute to the improvement in critical thinking skills, clinical judgement, and knowledge retention.

The fundamental goals of this innovative teaching method are to leverage technology to foster the development of active and engaged students, who are self-directed and committed to their own learning, thereby addressing the knowledge retention barrier discussed previously. Rather than a passive pedagogical method, the flipped classroom will include a combination of traditional lecture, asynchronous lecture recordings, problem-based learning, group interaction, formative quizzing, and just-in-time teaching. This combination of active and passive learning activities promotes a knowledge transfer scenario where students assume personal responsibility for knowledge acquisition with expert guidance. Students will develop an enhanced understanding of the course concepts, thereby creating a foundation for knowledge retention through the nursing program. Ultimately, with a focus on improved knowledge retention, there will be a demonstrated improvement in student and program success rates through faculty perception as well as on standardized testing.

Impact

Applying this teaching model has had its ups and downs. The first term mid-term evaluations in the pathophysiology course showed significant dissatisfaction. The student comments on these mid-term evaluations focused most negatively around their resistance to having the lectures delivered outside of class and not in the classroom. This was used as an opportunity to discuss the reasoning and rationale behind the learner-focused active classroom versus the teacher focused passive classroom. After reviewing these mid-term course evaluations with the students, we began including more lecture during the face-to-face class meetings. This traditional lecture period was about 30 minutes during each weekly three hour class meeting.

The end-of-course evaluations were markedly improved. Overall satisfaction in the course was universal. Many comments on these evaluations mentioned how unhappy the student was with the course at the mid-term point and how dramatically that had changed since. Many reported this to be their favorite class this term and that they appreciated having the recorded lecture to review in preparation for the quizzes and exams.

Results during the 2nd semester of using the flipped classroom model with a new group of 96 nursing students in the same pathophysiology course were not as positive. Students were generally very resistant to the change from the passive lecture format to pre-class lecture and active learning activities during class.

Review of the analytics on the engagement of these students with the pre-class prep activities showed alarmingly low levels of engagement. This resulted in students being frequently unprepared for in-class activities. Mid-term evaluations were less positive when compared to the previous semester. Similar to the previous term, the benefits of the active learning classroom were addressed during a class session. In response to student feedback, traditional in-class lecture was increased to about 45 minutes. While the end-of-term evaluations showed significant improvement over the midterm evaluations, overall end of term evaluations remained less than positive.

Learning outcomes, as measured on the three course exams during both semesters, were higher than scores during the two semesters prior to implementation of this model; though not with statistical significance. The first semester scores in the flipped classroom were higher than those during the second semester; again without demonstrated statistical significance. It stands to reason that this is likely related to lower student engagement with the pre-class lecture materials.

Continuation:

In order to increase engagement during the next semester, course grading has been adjusted to incentivize student engagement through required pre-class study guides and passport assignments required upon entry at the beginning of class. From informal focus group evaluation conducted during week 4 of the 3rd semester, students appear to have an overall high level of satisfaction. This is promising in terms of increased student satisfaction with this teaching method.

Through continued facilitation of pre-class engagement it is expected that we will have measurable increases in knowledge retention and ability to apply course concepts on standardized and licensure examinations. Students who were in the first group exposed to this teaching innovation are on track to take the NCLEX licensure exam following the winter term of 2017.

References and Resources:

Dyess, S. M. & Sherman, R. O. (2009). The first year of practice: New graduate nurses' transition and learning needs. The Journal of Continuing Education in Nursing, 40(9), 403-410.

Schlairet, M. C., Green, R., & Benton, M. J. (2014). The flipped classroom: Strategies for an undergraduate nursing course. Nurse Educator, 39(6), 321-325.

Towle, A. & Breda, K. (2014). Teaching the millennial nursing student: Using a "flipping the classroom" model. Nursing and Health, 2(6), 107-114.

Christopher Nakamura
Assistant Professor
Department of Physics

Chris Nakamura has been teaching in the physics department since Fall of 2012. He received his PhD and master's degrees from Kansas State University and his bachelor's degree from the University of Michigan. His primary research interests are in physics education research, where he is currently conducting research on student reasoning and the use of machine learning to assess reasoning. He is also engaged in the implementation of research-based teaching strategies across the undergraduate curriculum.

Laboratory Activities for Enhancing an Upper-Division Lasers Course

Abstract

I have investigated the use of short, demonstrative laboratory activities for aiding students in understanding upper division physics ideas from both theoretical and experimental perspectives. Developing this integrated understanding is a central goal of physics, but most traditional physics curricula separate theory and experiment. Increased effort to explicitly connect theory and experiment may be a useful goal in physics, and other disciplines. I developed, or adapted, 6 laboratory exercises for an upper-division physics course to help make these connections in a natural context: Lasers and Optoelectronics. My experiences developing the experiments highlight challenges inherent to the approach that must be overcome to justify the approach. In particular the nature of experimental work, time required conducting experiments, and larger impact on the course require significant consideration. Further work is warranted, but real solutions to these challenges are critical to continued implementation.

Introduction

University physics courses, and science courses in general, are divided into lecture courses that focus on theory and laboratory courses that focus on experiment. This mirrors the professional division of labor for physicists who largely specialize either as theorists or experimentalists. At the undergraduate level this division is pragmatically necessary, but also premature. Undergraduates are not ready to specialize, and professionals must master both aspects at the undergraduate level. Both aspects of the discipline feed into each other in natural ways, so it is logical to ask whether it is possible to more directly emphasize the relation through curriculum design. The interplay between theory and practice is evident in other disciplines as well. Since laboratory courses reference theory to provide meaningful context we ask if it is also possible to use experiments in lecture courses to highlight evidence for the theories.

Motivation

Effective teaching of the interrelations between theory and experiment is an open problem in physics education. Curriculum-development in upper-level physics is an active area of research [1-3]. Beyond traditional methods, much research is still needed to identify what works well. The motivation for this project is to use curriculum development to make explicit connections between theory and experiment in an upper division physics class. In my own personal experience students have really struggled when asked, "How would we test this idea?" The project uses short, demonstrative experiments to observe key aspects of the theory. Since the theory practice-interplay is key in many disciplines, lessons learned in physics may yield generally useful insights.

Instructional Technique

The lab exercises were implemented in Physics 442: Introduction to Lasers and Optoelectronics in Fall 2015. This course is a natural choice for three reasons. First, lasers and optoelectronics are inherently applied fields; experimental work is of critical importance for building lasers and optoelectronic devices. Second, the course is an elective on a special topic, so there is little concern of losing time better spent on critical aspects of theory. Third, the subject admits simple experiments that can be implemented without excessive design work. Small enrollment also helps.

I planned to introduce 6 experiments into the course. One experiment was to take two sessions. Thus, I planned to commit 7 class sessions to this work. The experiments were:

1. Generation and detection of electromagnetic waves in air [4].
2. Light emission and absorption in a laser gain medium (organic dye).
3. Laser beam quality and laser beam propagation.
4. Flashlamp pumped dye laser construction. (2 sessions) [5].
5. Light absorption and propagation in fiber optics.
6. Light detection with a solid-state Light Emitting Diode (LED) [6].

The experiments focus on central concepts, taking advantage of opportunities to observe how the theory applies in the physical world. Key skills sought in STEM students but not always taught explicitly are also developed (e.g. soldering, use of multimeters, oscilloscopes, etc.).

Equipment difficulties and safety concerns (regarding a high voltage power supply) led to the omission of the fourth activity. Subsequently, I identified a possible design using LED's that is safer and easeier. Students have shown interest in that. We planned to do the exercise outside of class, and work has begun. This activity may work better as a small research-style project than an in-class lab.

Impact

The small class size (5 enrolled) prevents meaningful quantitative data collection for analysis of impact. Also, there are not yet established metrics for instructional success in laser physics. However, I believe my experiences developing and implementing the activities provides useful insights into the benefits and difficulties associated with this approach. I have identified four key observations that point to the conclusions for the project.

First, I observed that I did not (even with significant experience with the equipment and knowledge of the theory) often get to think about the connections between experiment and theory while assembling and testing the labs. At that time my mind was occupied with technical work. I reflected on the connections before and after working in the lab. This would almost certainly also be true for students. Recognizing this, I began supplementing written lab handouts with in-class discussions in which the class would develop the experimental procedures and connect them to theory. I now believe that I should have followed up each lab with similar formal discussions.

The second observation was that I never followed my developed procedures step-by-step. I always had to make extemporaneous decisions to get good data or make the equipment function. This is inherent in experimental work, and must be true for students as well. No procedure can be detailed enough to avoid it, and we want students to figure things out for themselves.

The problem is that with less experience it generally takes students longer to manipulate equipment and figure things out. Unfortunately, class has strong time constraints at 80 minutes per class. Third, I have concerns about the role of confirmation bias. We want activities that showcase important aspects of the theory. However, there is a difference between teaching students to pull reasonable conclusions from data and constructing data that forces students to conclusions as if they were inevitable. I do not think I have strayed to the latter, but I did spend considerable time thinking about how to steer students from "bad" outcomes. While I did not initially consider this possibility I will consider it in future lab development projects.

Last, the experiments allowed me to discuss the theory in more concrete, explicit ways. Lab 2, for example, allowed clear demonstration of spontaneous emission of light for a material illuminated with light of a different wavelength, giving a clear illustration of what the theory predicted. Lab 3 allowed me to demonstrate what is meant by a Gaussian beam profile in a way that did not rely only on complicated equations. The labs allowed me to know that students had a common experience, a shared context in which I could discuss theory. This was useful for me, and may be one of the best benefits of the project. A valid question is whether doing a demo would give the same benefit; at this level I believe having had the students do the experiments provides much more context than a demo. Proof would require a true experiment.

It is difficult to test whether these kind of activities have significant impact on student learning over a theory-only course. No assessments targeted at this class currently exist and it is unclear what can reasonably be expected of students in upper-division courses. Research in physics education, or education more broadly, may provide clearer standards for that kind of assessment. My own experiences are ambivalent. The fact that introducing 5 sessions of lab likely necessitates another 5 sessions of discussion is challenging.

The change then totals 1/3 of the course. The class period time constraint is also challenging. Making quicker labs almost certainly means making labs that require less thinking, provide less practical experience, or both. Furthermore, shorter labs are less likely to allow genuine exploration, and more likely to succumb to the confirmation bias problem. Having shared experiences to connect to in lecture is useful, but adding more activities could send the course towards an abbreviated lab, which is undesirable.

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Playing to Learn:
Active Learning that Engages Students

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Abstract
Children learn by doing rather than watching or listening. Games, art projects, and other varied activities are utilized to teach children how to accomplish simple tasks like tying their shoes or to instruct them on more difficult concepts like anatomy. "Playing to learn," is an active learning practice, and has been used by educators of young learners for decades. Just as it is relevant for young learners, playing to learn also works with college aged students. It is my contention that we need to employ this practice more in the college classroom to facilitate greater student success. Through utilization of art projects, skits, everyday items like Play-Doh, and games like fantasy football, students at the college/university level can learn difficult concepts through play. These tactics have been incorporated into both my one hundred and two hundred level writing courses with excellent results. The students were engaged and actively learning about the concepts rather than simply hearing about them.

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The Collaborative Computer Science Education

Introduction

The Collaborative Computer Science Education (CCSE) project creates lesson incubators, which are close-knit groups of computer science teachers and students. These teaching and learning communities have access to an online system (www.teacherati.com) which helps them build up-to-date and peer-reviewed lesson materials, including videos, lab instructions and quizzes that enable measurable results. Computer science course materials change rapidly, with new programming languages, software upgrades and professional best practices changing almost as fast as curricula can be developed. Computer science teachers can now work together to keep their materials up-to-date. CCSE builds computer science education materials, not only for students in the classroom, but also materials for teachers to continuously improve their domain-specific skills in both technology and pedagogy.

Background

The U.S. requires more computer professionals than it produces. One problem is the lack of computer science teachers. How can educational institutions develop teachers with current and relevant computer science domain knowledge, especially considering the rapidly-changing nature of the computer field?

Rapid change is a major issue. Consider Android mobile app development. Each year Google introduces at least two new releases of the Android operating system, each release adding new features and deprecating others. By the time any teacher is trained, there is hardly time to develop curriculum, let alone to teach this material, before it becomes at least partially obsolete.

Computer professionals stay current with technology by reviewing new and proposed releases, collaborating and participating in online forums such as StackExchange. This effort, coupled with the experience of producing working commercial code, is a full time job. Computer professionals generally do not have time to teach. They usually are not interested in teaching and possess no teaching credentials.

Except in rare circumstances, computer professionals cannot be teachers. Teachers maintain current pedagogical skills by studying modern teaching techniques. Sometimes they attend conferences and publish papers on pedagogy. Teachers focus on delivering material to their particular students, and sometimes pedagogies apply only to narrow student populations.

This, coupled with day-to-day classroom teaching, is a full time job. While computer professionals tend to specialize in a few areas, teachers tend to teach a range of topics. Teachers do not have time to maintain current technical skills for all of the computer related subjects they teach. Further, teachers usually are not interested in commercial coding, and it is rare for a teacher (or teacher's employer) to provide sufficient budget and time off for a teacher to maintain the same level of technical proficiency as an active computer professional. Except in rare circumstances teachers cannot maintain the same currency and level of technical proficiency as computer professionals in all of the areas in which they teach.

Instructional Challenge

Rather than turn teachers into programmers, perhaps we can automate the aspects of the teaching process that require the highest levels of domain knowledge, such as curriculum development. This already happens in other domains. For example, some people watch YouTube videos or browse web sites to learn how to fix their own cars rather than take vehicles to mechanics. Certified mechanics may have written the repair instructions, but average everyday people can apply this expertise without having to become certified themselves.

The problem with YouTube videos is they do not measure results. Businesses, grant-awarding institutions (such as the National Science Foundation), universities, secondary and even elementary schools who teach computer science may require quantitative results in order to justify the investment of time, even if the materials are free.

The purpose of this project is to mini-crowdsource computer science teaching. The crowd would not be everyone, only members of a select community. This is necessary so that trust can be developed between the participants so that suggestions can be made without fear of getting criticized. The goal is to get teachers to collaborate, to share materials, and to share ideas for continuous improvement.

Consider a typical 14-week course, which meets 2 days per week for a total of 28 class sessions. Traditional teachers would develop lesson plans for all 28 courses, sharing nothing. If the proposed plan succeeds, instead of one teacher developing 28 mediocre lessons, 14 teachers would each develop 2 awesome lessons and all 14 teachers would share all 28 lessons. Student feedback would be aggregated and teachers who used the lessons could suggest or even make improvements.

Potential Impact

The potential benefit could be enormous. The first obvious potential benefit is saving teacher time. Computer science teachers must find ways to get more done in less time. A teacher with 28 lessons per course and 3 courses per semester must prepare 84 lessons per semester—a major time issue. If there are graded assignments for all 84 lessons, then grading becomes a time issue, too. For subjects whose material is static, after several years of service the teacher may not need to prepare lessons as often. But in fields where content changes frequently productivity must be accelerated. Working together, collaborative teaching, is one way to achieve this.

A second possible benefit might be an acceleration of the curriculum development process. If materials can be delivered by teams instead of individuals, theoretically, more material could be delivered faster.

A third possible benefit is greater student engagement. Students who are especially advanced compared to their peers may be more engaged if participating in making videos or writing lab notes. In terms from Bloom's taxonomy, these students can operate at the creating level, while others may be operating at the understanding or evaluating levels.

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Notes

- **What ideas sparked your interest?**

- **Based on the Keynote Presentation, Workshop, and Showcase Sessions, what strategies might you use with your students to enhance their motivation and learning?**

Additional Notes

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