Engaged Student Learning

Volume 2

About the Book

Engaged Student Learning: Essays on Best Practices in the University System of Georgia, Volume 2, is a publication of the University System of Georgia. It arose from a desire to recognize the excellence of all individuals who had been nominated for one of the prestigious Regents' Awards for Teaching Excellence. These awards are the USG's highest recognition of teaching and illustrate the USG's commitment to ensuring academic excellence for the citizens of Georgia.

People

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The essays contained in this volume went through a double-blind peer-review process. The USG would like to thank the following reviewers for giving insightful feedback to the authors of this publication:

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Engaged Student Learning: Essays on Best Practices in the University System of Georgia

Volume 2, 2020

Edited by
Denise P. Domizi

Foreword by Tristan Denley

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Articles

Foreword

Replications of Student Success across the USG

The focus on the success of students through the principles of the Momentum Year and the Momentum Approach has brought about a number of innovations in how we structure and offer co-requisite learning, advise our students, and positively engage student mindset, for several examples.

Good ideas also tend to encourage applications of them in other contexts. When we began our Momentum Year work together, it was organized around specific design principles. But the student success lens that is the foundation of our Momentum program, invites similar innovation in the many settings across of the USG. The excellent work that is being done by many people across many divisions of our campuses work together to create and ensure success for each of the students at our institutions of higher education. With the success of our students as our topmost aim, we are enjoying growth in the Affordable Learning Georgia OER program, the establishment of nexus degrees, and even utilizing the connections between financial aid and student success.

National sponsors have noted the multifaceted approach that is used to achieve student success in Georgia, and our programs garner not only attention but also much-needed funding to advance our innovative thinking. I am confident that we will find new ways to strengthen our work, even through the many pressing challenges brought by the current pandemic.

The current volume, Volume 2 of *Engaged Student Learning*, contains a number of excellent articles that embody the student success approach to learning. These authors are USG faculty who have been nominated for consideration for one of our USG Regents Teaching Awards, and, accordingly, their entire portfolio of work already has been acknowledged and appreciated. By inviting these nominated faculty to submit an essay on one of their best practices, our Office of Faculty Development has created a way for faculty across the USG and beyond to appreciate some of the best of their work.

In essence, this peer-reviewed publication connects individual course innovations to the larger Momentum Approach design and offers our excellent faculty an additional forum to display their best student success pedagogies and course activities.

Dr. Tristan Denley
Executive Vice Chancellor and Chief Academic Officer
University System of Georgia

Preface

Pivots, Pandemics, and Professional Development

I have been so privileged to teach English courses for many years, and, in some years, in conditions similar to the challenges we face now. In Louisiana, Hurricane Katrina dislocated thousands of students and reduced the financial support institutions received at the same time.

Even before that disruption, the systemic competition for limited resources in Louisiana clearly signaled to active, creative departments that alternative ways to fund good ideas must be regularly sought. I learned there as a professor and administrator that pressures of circumstances can lead to better teaching, programs, and student success.

The conditions we face now challenge us to think and act in new ways, and the future is rich with good possibilities for greater inclusion and collaboration, for smarter engagement with each other and our students, and for the benefits of a full analysis of all that we as faculty do. The changes that result can truly be steps forward.

The shift from enthusiastic telling from the lectern to immersion in collaboration of small groups is a good example of the kind of pivot in pedagogy that works so much better for students. The sage on the stage as a central metaphor for teaching in years past has given way to the player-coach, or guide. Now students even in their first years can learn more directly and independently, with the support of the expert with advanced degrees.

These are simultaneously the best and worst of times, and when things settle down into a new routine in a year or two or three, I anticipate that several good pivots in faculty development will have emerged from this pandemic.

These essays in Volume 2 of *Engaged Student Learning* represent the best thinking that foretells more good things to come.

Sincerely,

Jeffery Galle, Ph.D.
Associate Vice Chancellor for Academic Affairs, Faculty Development
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Editor's Introduction

Teaching and Learning Center representatives share a dinner after a bi-annual GA-CTL RAC meeting.

In early March 2020, a group of University System of Georgia (USG) faculty developers met at Valdosta State University for a bi-annual Regents Advisory Committee meeting. A tight-knit group, there would normally have been lots of hugging and hand-shaking, but with the first cases of the coronavirus spreading through the country we instead elbow-bumped and bathed ourselves in hand sanitizer. Having not yet learned about social distancing, we all went out to dinner and happily packed in without a thought. Social interactions still felt fairly normal then, but just a few weeks later in mid-March, I decided to postpone lunch with a friend and former colleague "until this blows over." That was the first time that my social plans changed because of the virus. Then, there was the first time that I said "no" to my children who wanted to have a sleepover, the first time I wore a mask in public, the first time a faculty member redesigned an assignment for remote instruction, the first time a student logged on to the learning management system from their home rather than going to class, and on and on.

First-time experiences can leave us feeling tentative and unsure, but as educators we are equal to the task of leading others through them. We are used to introducing learners to new concepts and ideas, and at our cores we ourselves are lifelong learners. Faculty members are spending their summer designing blended/hybrid/HyFlex/flipped courses, and students and faculty alike are preparing for a fall semester unlike any we have seen before. Life has been strange of late, but it continues to move forward, and we continue to engage and plan as best as possible.

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When we sent out the call in mid-January, 2020 for essays for Volume 2 of *Engaged Student Learning: Essays on Best Practices in the University System of Georgia*, most people in the United States had never heard of the coronavirus. Essays poured in from nominees of the Regents' Teaching Excellence Awards—the University System of Georgia's highest recognition of teaching in the state—as did volunteers willing to act as peer reviewers. Then, one day before the March 13 submission deadline, the twenty-six public institutions that comprise the University System of Georgia were told that, based on the governor's recommendation, all institutions would suspend instruction for two weeks to give state officials time to assess the situation, and to provide faculty and staff time to test continuity plans and prepare for online instruction. Days later, it was announced that campuses would be closed for the remainder of the spring semester. By early April, it was decided that summer classes would also be taught remotely, and studies-abroad were cancelled. Fall plans remained in question. Faculty and students were forced to become not just familiar with but proficient in means of remote instruction that many had never encountered before, and issues like bandwidth and equity became major topics of conversation. Accompanying these numerous transitions was the stress of trying to keep faculty, staff, and students—and their families—both physically and mentally healthy. With college campuses, K-12 schools and daycare facilities closed, faculty found themselves teaching the remainder of spring semester from home, sometimes with small children competing for their attention. This was the unprecedented backdrop to the assembly of Volume 2.

Many of this volume's reviewers are directors and staff from centers for teaching and learning (CTLs) on our campuses. When I sent these essays out for review, literally the week after we were told that institutions would remain closed for the rest of the semester, many reviewers were extraordinarily busy preparing their campus faculties for the shift to remote instruction, helping to prepare continuity plans, and designing and delivering remote workshops to help faculty with everything from developing a plan to communicate with students and adding quizzes to the learning management system, to seeking out some form of personal work/life balance in this new reality. Despite the upheaval, uncertainty, and increased workload, every reviewer came through with thoughtful and timely feedback, and every author—themselves preparing for an uncertain fall semester—remained engaged throughout the revision and publication processes. A few authors even updated their essays to reflect on how the content and contexts were impacted by the coronavirus.

As summer draws to an end and faculty plan for the fall semester, I read these essays and cannot help but feel that they were written in another time, having taken somewhat for granted a focus on aspects of teaching in the classroom. None of us knows what lies ahead, or what the future holds for the traditional face-to-face classroom, but I do know that faculty everywhere will rise to the occasion and continue to make every effort to enable meaningful learning experiences for their students.

Denise P. Domizi, Editor
Director of Faculty Development
University System of Georgia

Sticking with the Outcomes: Using Sticky Notes to Assess Student Learning in a Literature Course

Jessica Lindberg
Georgia Highlands College

Author Biography

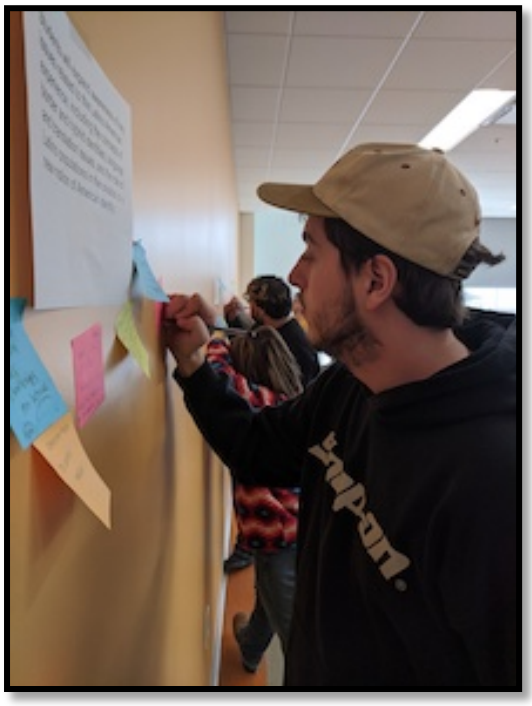
Jessica Lindberg, PhD Poetry, started working at Georgia Highlands College as an English tutor in 2002. She now serves as the Humanities Division Chair covering English and Spanish.

On the last day of our sophomore-level Latino/a Literature class, students entered the room prepared to sit passively and have me tell them exactly what would be on the final exam. Instead, I wanted them to take ownership of connections they had made between works of literature, global perspectives, writing, and research skills. I wanted them to have an "a-ha" moment about how much they had learned during the course.

In order to do this, I printed out the learning objectives listed in the course syllabus and taped these to the walls around our classroom. Each student had to identify a work of literature, theme, or assignment they saw as directly connected to each one of the objectives. They tagged their contributions with sticky notes (Post-It Notes ®). While physically moving through the classroom space, students began remembering and revisiting the concepts we had covered throughout the term. Thus, our last day of class became a metacognitive exercise as well as a student-guided study session for the final exam.

Uncomplicated Setup

To set up the room, I printed out the five learning objectives from our syllabus and taped them the walls. As students entered the room, I gave them stacks of sticky notes, inviting every student to take up to ten notes. They had to walk around the room, read the learning outcomes, and post something they learned from the class that aligned with that objective. They could post up to ten notes, and every note also earned them one point toward their Class Activities grade. This means they could erase/replace a zero on a quiz grade with these ten points. They were eager to take part.



To provide an additional challenge, I would not let them repeat or reword notes that were already posted by their classmates on any of the objectives. They had to dig deep to create original responses.

Observations

As students moved around the room, they became invested in remembering lessons and activities. Their impromptu group discussions as they huddled near the outcomes drew connections between themes and ideas. The activity solidified some of the concepts and major themes of the course. I heard several comments along the lines of "oh yeah, I forgot about that!" During the activity, they seemed to become nostalgic for the class days we spent in deep discussion of writers and texts. I had no preconceived notion of what they might come up with for their sticky notes. Reading their comments, I saw a much

deeper and more interwoven connection of material, texts, themes, and concepts than a simple test answer or assessment survey would have provided.

Sticky Notes: What They Wrote

With twenty-eight students in the class, and each student aiming to write ten sticky notes to earn a full ten points, the classroom walls quickly turned into color-blocked patterns of thought. A few examples of what students wrote below each learning objective are listed below:

1. Students will place works of literature in their historical and cultural contexts.

   I learned about the term "borderlands" & its importance within the context of the literature.
   I learned about the impact Caesar Chavez had on society.

2. Students will identify literary styles and social issues in the work of prominent authors associated with the time period covered in the course.

   I learned about the Latinx struggle through different perspectives in the stories and poems.
   I learned about the lasting impact of the poem "Yo Soy Joaquin" in the Chicano Civil Rights movement.
   I learned about the Nuyorican Poet's Café and its importance for Puerto Rican New Yorkers.

3. Students will synthesize information in standard English to support ideas or arguments as they examine literary works.

   I learned how to break down a story by Judith Ortiz Cofer and see how that story related to the experience of second-generation immigrants.
   I wrote about how often children are the narrators in Latino Literature and what that says about the future.

4. Students will evaluate or make inferences about information, arguments, or observations.

   I learned that you can't always trust the translation. You have to ask who is translating, and what their motivations are.

5. Students will demonstrate effective use of appropriate literary terminology.

   I learned the term "linguistic terrorism."
   I learned the term "diaspora."
   My favorite new word is "Loisaida," which is what Nuyoricans called the Lower East Side.

Reflection

Assessing learning objectives in a meaningful, measurable way is a challenge in any discipline. During this activity, I witnessed students connect ideas and engage in conversations akin to what takes place among professional critics and writers. Interacting in this way also brought the learning objectives back out of the neglected tomb of the syllabus, a document that students often forget after the first day of class.

This activity is not limited to literary studies; it would be a useful exercise in an American History class to encourage students to move beyond a simple recall of facts. In an Organic Chemistry class, this exercise could be used at the end of chapters or units for students to judge their mastery of the information. In short, the activity manages to unify the course structure and design with the course content in a way that makes learning *stick*.

Mindfulness and Aesthetic Works for Learning Caring in Nursing

Kelly Dyar
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Author Biography

Kelly Dyar, Ed.D, RN, CNN, CNE, is an Assistant Professor of Nursing at the University of West Georgia. Her research focuses on military veterans as students and the incorporation of caring science and aesthetics into nursing curricula. In 2017 she received the Doctoral Research Award from the National League for Nursing and the Southern Nursing Research Society and was the 2019 recipient of the DAISY faculty award. Her professional work includes serving on the executive board of the Georgia Association for Nursing Education as the organization's current President-Elect.

The public often views nurses as caring. However, caring can be an abstract and challenging concept for nursing students. Thus, I set a goal of incorporating content and activities to aid nursing students in understanding and integrating caring into their professional practice. In this essay, I describe the incorporation of activities to meet this goal. These activities include a caring theory, mindfulness, and aesthetic works that aid nursing students in learning the concept of caring.

Nursing is a caring and theory-based profession. For this reason, I incorporated content on caring into a Professional Nursing Concepts 2 (NURS3102) course. In this course, students explore nursing professionalism through multiple concepts such as ethical and legal issues, communication, and teamwork. I incorporate the concept of caring through Jean Watson's theory of human caring. Watson (2008) is a nursing theorist and focuses on caring within nursing practice. Widely adopted by nursing programs and healthcare facilities, this theory encourages nursing behaviors such as caring for self and others, practices of lovingkindness and equanimity, and using multiple ways of knowing (Watson, 2008). This theory also encourages mindful practices as a way of knowing ourselves, which then enhances our ability to know and appreciate the humanity of others.

Orange Mindful Meditation*
Adapted from Sitzman and Watson (2014)

Consider the orange as the core and trim of nursing. Close your eyes, taking two slow, deep, cleansing breaths. Now, hold the orange, feeling the weight in your hand. Consider the color, similar to the sun, warming you and the earth. Consider the connections to yourself, others, the orange tree, and the earth. See the orange tree with the bright green leaves and the colorful fruit. Take a deep breath, seeing the tree offering oxygen for your survival. Exhale slowly, seeing your offering of carbon dioxide so the tree can flourish and produce the nourishing fruit. Now, imagine the feeling of opening the orange, the fragrance as the juice is revealed, and the flavor exploding on your tongue. Pause to enjoy these sensations. Open the fruit, peeling away the skin. Inhale the perfume of the fruit, allowing it to wash over you and fill you with joy and warmth. When you are ready, open your eyes and place a section of the fruit on your tongue, allowing it to linger before you begin to chew. As you chew, visualize the fruit nourishing your body to allow you to fulfill your purpose of learning, growing, and caring for yourself and others. When you are ready, take a few deep cleansing breaths and return your focus to the room.

*Invite students to participate in a way they feel comfortable.

To be consistent with the caring theory and to provide an opportunity to practice mindfulness, I begin the course with a mindful exercise. Watson describes nursing as similar to an orange in which the center, or core, is the enduring and unchanging component of nursing that includes caring and the art of nursing practice. The peel, or trim, is the outward, more visible and changing component of nursing, such as technology and specialization. After explaining the idea of trim and core, I offer the students an orange and invite them to participate in a mindfulness exercise. Although some students choose not to close their eyes, from observation, all students somehow engage with this activity, which integrates the caring theory and offers an example of self-care through mindfulness in a way that is brief yet

powerful. As I observe students participating, I can see them begin to relax, smile, and enjoy the moment. Many students have commented that their anxiety lessens, and they enjoyed a few moments to focus on something meaningful. The mindfulness meditation exercise takes less than five minutes and allows the students to experience a moment of connecting with self, others, and the greater world. This exercise also prepares the students to participate in mindful moments throughout the course.

Mindful moments begin when the students enter the classroom. The class meets weekly, and I bring art supplies such as paper, markers, crayons, and colored pencils. I invite students to take whatever they would like to use during class, and I find that many students take paper and other items and draw or doodle during class. After covering the day's professionalism content, we explore a component of the caring theory. For example, we discuss how professional concepts and caring theory connects to nursing practice. After discussion, I give students time to engage in a mindful moment, guided by a prompt. The prompt encourages students to weave the professionalism concept with the caring theory. We agree to have a quiet room to allow mindful focus and respect for the creative processes of others. As music softly plays, students mindfully consider the prompt before using the art supplies to express their responses. Responses from students have included narrative stories, drawings, and poetry. These aesthetic works prepare students for the course capstone assignment.

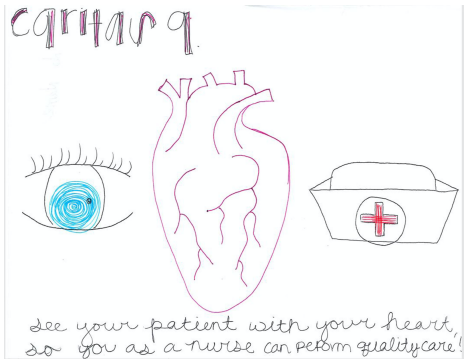

Figure 1: Mindful Moment Example

The capstone assignment is an aesthetic project. Students synthesize course concepts with the caring theory by selecting any medium to express how caring and nursing professionalism are linked and related, demonstrate what they have learned, and show how they are beginning to view themselves as a caring professional nurse. The aesthetic projects reveal that students can demonstrate creativity and caring as they consider their influence on the profession of nursing. Students have created lyrical works, poetry, sculpture, videos, paintings, and textile works, demonstrating creativity and synthesis of knowledge. Students present their work in an art show format, and nursing faculty attend to view the projects.

Students share that these activities have been beneficial to their learning and understanding of the true essence of caring in nursing. After teaching this course using these activities for several semesters, I conducted an IRB-approved study to explore the students' perceptions of these activities related to their overall learning and, more specifically, learning how to be a caring nurse. Quantitative results indicated that the students perceive they can learn through aesthetic projects (Dyer & Dever, 2019). Qualitative feedback supported this data. Regarding learning in general, one student wrote, "It allowed us a repetitive foundation where we learned something and then created something. Our creation will help us individually remember about aspects of caring science." Another wrote their thoughts stating the best thing about the final project is having "…the avenue to refresh and harness the knowledge acquired over the course of the semester." Finally, one of the most compelling student comments indicates there is perhaps something self-actualizing about these activities in writing, "the assignments made me realize the importance of introspection and I learned more about the person I am and the person I am striving to be."

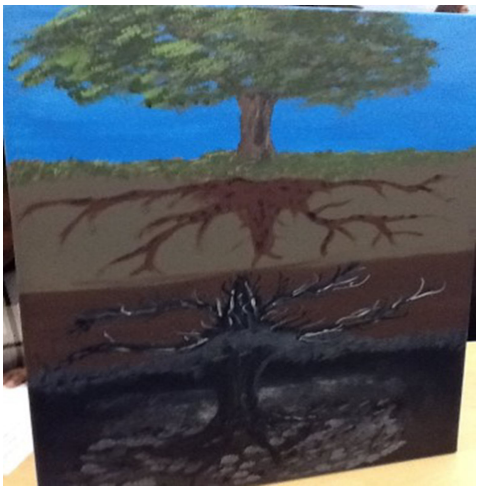

Figure 2: Aesthetic Project Example

Nurses must care for self and others. Learning a caring theory allows students to build a foundation for a caring practice. Engaging in mindfulness allows students to care for themselves in preparation for caring for others. Mindful moments provide students a moment to practice mindfulness and creativity in expressing their learning. Aesthetic projects provide a way for students to synthesize multiple concepts into a cohesive whole. Student perceptions of these projects have been favorable. These activities have enriched the course content as nursing students consider themselves as a caring individual and future caring professional.

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Specifications Grading in STEM Courses: Increasing Rigor and Student Perseverance

Mai Yin Tsoi
Georgia Gwinnett College

Author Biography

Mai Yin Tsoi is a charter chemistry faculty member in the School of Science and Technology at Georgia Gwinnett College (GGC) with extensive classroom experience at the K-12 and post-secondary levels. As a Professor, she conducts student-led mixed-methods research in Science Education. She created and currently leads the GGC Specifications Grading Group, a 23-member Faculty Learning Community dedicated to the exploration and implementation of specifications grading in student learning. To date, over 2,500 students at GGC have completed a specifications grading-based course. She was named Gwinnett County's Teacher of the Year in 2006 and a finalist in the Georgia Teacher of the Year 2007 competition. She received the GGC Faculty Excellence in Service Award in 2010 and the GGC Faculty Excellence in Teaching Award in 2019.

Introduction

Specifications grading (SG) is an assessment strategy based on mastery learning, clear learning objectives, and frequent evaluations and feedback. Linda Nilson (2015) published *Specifications Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time*, wherein she describes a novel methodology that gives students control of their grades through multiple attempts, with limitations, on course assessments of course objectives. High rigor mastery is defined as a cut-score set at minimum competency with no partial credit assigned. Students either master or must retry objective assessments to earn higher grades. Preliminary observations suggest that, regardless of subject area, SG can be used as an alternative to traditional assessment methodologies in STEM courses.

Description of Specifications Grading

I first read about the concept of specifications grading (SG) in an article by Joshua Ring (2017). SG has three tenets: 1) student grades should accurately reflect student mastery of course content, 2) students should have multiple opportunities to remediate any misconceptions, and 3) course content should be delivered in bite-sized chunks versus chapters of content in a single exam period.

During spring 2017, I jumped into implementing SG for two sections of first-semester organic chemistry, each twenty-four students. I divided my course content into twenty-two discrete course objectives, with a short quiz for each objective. Afterwards, I noticed more A's in my class than ever before. Student comments were overwhelmingly positive and, for the first time, none of my students appealed for extra points in their final grade. Students asked for more courses with SG, even calling the Dean's office before registration opened!

I coached twenty-three faculty in several disciplines over the next three years, spending multiple weeks with each instructor honing their course objectives and assessments to align with the SG methodology, the instructor's own philosophies, and teaching style. This last semester, I onboarded our first non-STEM course: Introduction to Economics. The following table of current SG courses at our school illustrates that the SG methodology is agnostic to both discipline and course-level.

Table 1: Courses using SG methodology at GGC.

Biochemistry	BCHM 3100
Survey of Chemistry I	CHEM 1151
Principles of Chemistry I	CHEM 1211
Principles of Chemistry II	CHEM 1212
Organic Chemistry I	CHEM 2211
Organic Chemistry II	CHEM 2212
Organometallics	CHEM 4000
Integrated Lab II (senior capstone)	CHEM 4702
Quantitative Reasoning	MATH 1001
College Algebra w/ Support	MATH 0098
College Algebra	MATH 1111
Pre-Calculus	MATH 1113
Calculus I	MATH 2200
Calculus II	MATH 2210
Cell Biology	BIOL 3400
Introduction to Physics I	PHYS 1111
Introduction to Physics II	PHYS 1112
Intro to Environmental Science	ESNS 1101
Anatomy & Physiology I	BIOL 2451
Biomechanics	EXSC 3500
Intro to Economics	ECON 2100

In SG, instructors are free to infuse this assessment method in ways that support their individual teaching styles. However, all our instructors set the cut-score, or minimum level of proficiency, at 80% for each assessment. When a student met or exceeded this minimum level for an objective, an assessment PASS was recorded in the gradebook. Otherwise, an assessment TRY AGAIN was recorded and students could retake a new assessment version of that objective until a score of 80+% was earned. There was no partial credit for student answers – each question was full credit or no credit. This streamlined the grading process and freed up instructor energy for feedback and comments. Also, there were no grade penalties for retakes. The number of assessments passed determined the SG portion of the overall course grade.

According to Nilson, course objectives are "a contract" between the student and the teacher because they clearly define the skills and knowledge required for mastery of the course content. Therefore, each instructor spent copious amounts of time distilling their courses into the bare essential objectives and more general objectives. Each objective was assessed using a five- to ten-point scale administered during class time. If not passed, then students could sign up for a retake. Instructors teaching the same course created shared assessment item banks to assist with version creation and control.

Retake Cooperative

When the demand for retakes became untenable for the twenty-three instructors, a "cooperative" was formed where each instructor would proctor a weekly shift and administer retakes for any student in an SG course. An online request system was designed whereby students could choose which retake and a convenient time/day. The system would alert the teaching instructor and deliver the appropriate retake

version to the proctoring instructor. At our school's testing center, the dedicated SG Retake Room has hosted over 10,000 quiz retakes to date.

Artifacts of Specifications Grading

All SG instructors show a video (developed by me and GGC's Educational Technology Office) during the first week of classes. The methodology is thoroughly described and repeatedly explained to all students before Add-Drop period ends.

Link: https://bit.ly/2pq7NxR

Figure 1: Screenshots of the Introduction Video Shown to Students

Preliminary Data from Scholarship of Teaching and Learning (SoTL) Research on specifications grading

Below are some preliminary results from the work of nine senior student SoTL projects I led, examining the impact of specifications grading in STEM courses.

- There is a statistically higher number of A and B course grades in SG courses as compared to traditional courses. ($p = 0.041$, $n = 337$)
- There is no significant difference in final course grade between students of different age groups in SG courses. ($p = 2.47$, $n = 337$)
- There is no significant difference in final course grade between Caucasians, Asians, African-Americans, Hispanics in specifications grading courses. ($p = 1.20$, $n = 337$)
- Students perform statistically better on tasks/content on the Final Exam for which they have taken 3- 4 retakes of the aligned quizzes. ($p = 0.018$, $n = 83$).

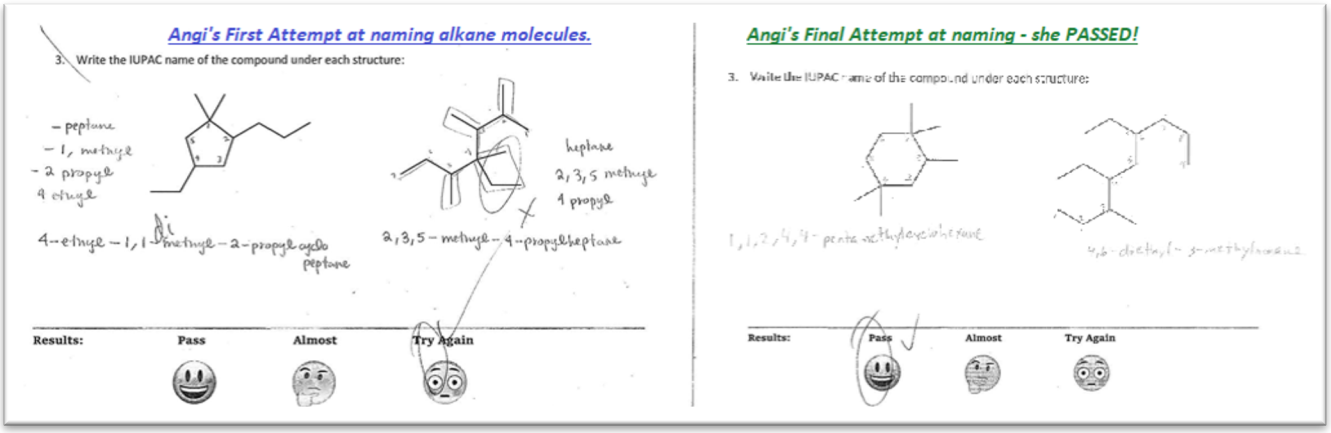

*Figure 2: Example of Quiz Retakes and Student Development Over Time. Note that on the student's final attempt, the student does not write any "hints" for help in the margins of the retake. The student has **mastered** the skill through SG.*

Unsolicited Student Comments on Specifications Grading

> *Specs Grading is one of the greatest gifts a professor can offer a student. I liked the way it allowed us to focus one chapter at a time instead of learning it once…It made me more focused and not as overwhelmed.*

I think Specs is a far superior system because the spec check system allows students to learn the material. I think it is especially important in these gateway courses as majority of the material learned will be needed in later courses.

The specs grading system not only did it give me an opportunity for a better grade, but it actually helped me learn the material and kept it fresh in my mind. Best system ever!

Conclusion

I found the SG methodology to be effective, discipline-agnostic, and simple to understand by students and faculty alike. Because instructors could make personalized choices about their teaching and class policies with SG, I was able to onboard many faculty with varying philosophies and assessment styles. Among the students, SG has become popular because a standards-based system is objective and fair to all invested parties. Moving course assessment towards mastery learning and providing students with multiple opportunities for mastery, with clear communication about expectations, are positive modifications that can impact student learning. At the very least, SG is a worthy exercise in professional development as educators reflect on the roles of course objectives and traditional assessment practices.

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Silencing the Whispers: Experiential Learning as a Strategy to Empower Pre-Service Teachers and Elementary Writers

Jennifer K. Allen
University of West Georgia

Author Biography

Dr. Jennifer K. Allen has a B.S.Ed. in Early Childhood Education from the University of Georgia and a M.Ed. in Reading Instruction from the University of West Georgia. She holds an endorsement for Gifted Education, ESOL, and Reading Instruction. She earned a PhD in Language and Literacy Education from the University of Georgia and is now an Assistant Professor at the University of West Georgia in the Department of Literacy and Special Education where she enjoys teaching site-based literacy courses as part of the Professional Development School model.

While the rewards of teaching future educators are numerous, the tension in reconciling the aims of higher education with the demands of P–12 settings is ever present. Sometimes, the whispers of "Well, this approach *sounds* great, but how will it *actually* play out in the classroom?" sound more like sirens. I have found that answering these whispers of reluctance with *actual classroom experience* is one of the most successful teaching practices I can employ with pre-service educators. In this article, I elaborate on a specific literacy experience I designed to give my students an opportunity to gain hands-on experience facilitating writing lessons with elementary students.

Purposeful Partnerships

Professional Development School (PDS) partnerships between universities and P–12 schools provide opportunities for pre-service teachers to facilitate developmentally appropriate instruction in authentic contexts while university faculty and in-service teachers provide collaborative guidance, feedback, and support (National Association of Professional Development Schools, 2008). Further, these partnerships allow P–12 students to benefit from lower teacher-student ratios while also gaining access to innovative teaching practices. As a PDS site-based instructor, I have the opportunity to teach some of my literacy courses at local elementary schools instead of on the university campus. Thus, I am able to witness first-hand the advantages of mutually beneficial university-school partnerships as the PDS students (pre-service educators) I teach at the local elementary schools have the unique advantage of *applying* their literacy learning in authentic contexts.

WIN Writing Time

The PDS site-based literacy course I teach focuses on writing pedagogy. Many of the students I teach report that they once loved to write as young children but lost their joy of writing as they progressed through school because it felt more like a meaningless chore than a meaningful, powerful experience. Because I want to lead my students into the teaching profession possessing a passion for writing and a confidence in themselves as teachers of writing, I designed an approach to writing instruction that I hoped would boost their confidence both as writers and as teachers of writing as well as provide elementary students with a way to connect with writing through high-impact, low-stakes experiences with writing (Fletcher, 2017).

The applied literacy learning experience I designed in partnership with teachers at the local elementary schools is called WIN Writing Time. This initiative involves Tall Teachers (pre-service teachers)

collaborating in pairs to facilitate writing activities that are Worthwhile, Interest-based, and No-stress (WIN) with Small Teachers (elementary school students).[1]

Meaningful and Effective Writing Experiences

To set WIN Writing Time in motion, Tall Teachers administer a writing interest inventory to determine their Small Teachers' strengths, interests, and habits as writers. Based on those results, Tall Teachers plan and implement weekly writing activities that foster engagement in high-impact, low-stakes writing experiences for their Small Teachers (Fletcher, 2017). This means that the writing opportunities they plan are fun, student-centered experiences that bring joy and meaning to the writing process. These weekly WIN Writing sessions last about forty-five minutes each and take place over the duration of the semester. The meaningful writing experiences my students plan include a consideration of many of the concepts we learn and discuss in our course, such as the following:

Figure 3: Tall Teachers engage Small Teachers in a form of Rebus Writing, where words and syllables are represented by stickers.

- developing a teacher-as-writer mindset, so that Tall Teachers can be seen as credible teachers of writing because *they write themselves* (Whitney et al., 2014);
- allowing for student choice in writing topics and formats so Small Teachers have opportunities to explore writing in a way that connects to their lives (Fletcher, 2017);
- utilizing mini-lessons, where Tall Teachers offer chunks of curriculum that help Small Teachers understand and meet grade-level writing expectations (Calkins, 2003; Ray & Laminack, 2001);
- modeling, where Tall Teachers write in front of their Small Teachers to coach them on writing craft, genre elements, and create a community of supportive writers (Graves, 1983; Zumbrunn et al., 2017);
- having conversations about writing, so that Tall Teachers can provide specific and timely feedback to small teachers (Calkins, 1994; Calkins, 2003; Fletcher & Portalupi, 2001; Ray & Laminack, 2001);
- leaning on mentor texts to spark ideas for writing and helping students learn to read like writers to envision possibilities for writing structures and craft (Ray, 1999; Shubitz, 2016);
- and empowering students to share their writing, which helps to build confident writers as well as a community of writers (Calkins, 1994; Ray & Laminack, 2001).

WIN Writing Time encourages informational, persuasive, and narrative writing, all genres that elementary writers are expected to master. This past semester, for instance, one group worked on designing a sports

[1] I borrowed this terminology from faculty at the University of South Carolina; it reflects Rosenblatt's (1978) transactional approach to teaching and learning, as both groups are continuously teaching and learning from one another.

magazine that featured a brief biography of the Small Teacher, football-related riddles, an advertisement page for sports-themed bandanas, and a narrative about how a young boy finds his confidence by scoring the winning touchdown for his team. Another group wrote small moment stories based on personal experiences, and the Tall Teachers used mentor texts, graphic organizers, and modeling to help their Small Teachers zoom in and capture the sensory details and concrete language to create mind movies for their readers. Still another group designed a graphic novel that focused on using visuals and text to share the fictional adventures kids experience when they explore an amusement park.

Impact of WIN Writing Time

During WIN Writing Time, I have observed growth in both Tall and Small Teachers who come to see that writing can be a powerful, meaningful, and enjoyable form of communication and expression. Each week, when my students enter the classroom to meet with their Small Teachers, they are welcomed with bright smiles and enthusiastic attitudes, revealing their excitement about having some choice in their writing experiences. Small Teachers also gain confidence as writers, developing their writing skills through low-stakes practice and gaining the courage to share their writing, both in the small- and whole-group settings. Tall Teachers learn about the role student choice plays in motivating young writers and realize how creating a stress-free, non-judgmental writing zone yields writers who feel free to take risks with writing. Additionally, Tall Teachers experience an increased level of buy-in and engagement from the Small Teachers because the Small Teachers feel a sense of empowerment when they are valued for what they bring to the writing experience. Most importantly, Tall and Small Teachers discover that writing promotes connections with one another as they learn about common interests, unique life experiences, and shared thoughts and feelings.

Figure 4: Tall Teachers create comic style writing pieces alongside Small Teachers, using frames with images and text to tell a story.

Grounded in the need to shift understandings of writing instruction, which are often prescriptive and formulaic, these writing partnerships allow my students to investigate ways we as teachers may unintentionally contribute to the fact that writing is often viewed as an empty and meaningless exercise instead of an engaging and purposeful experience. WIN Writing Time helps my students see the possibilities of meeting grade-level curricular expectations *while still making learning meaningful and engaging for students*. Thus, the whispers of disbelief that once clouded their vision and caused them to wonder if meaningful writing in the classroom is possible are replaced with exclamations of assurance that authentic engagement with writing can be fostered by creating supportive writing environments that celebrate choice, interest, creativity, and collaboration.

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Psychological Safety by Blending in Engineering Mechanics

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Author Biographies

Donald Webster joined the faculty at the Georgia Institute of Technology in 1997 and is currently the Karen & John Huff School Chair and Professor in the School of Civil & Environmental Engineering. Dr. Webster's research expertise lies in environmental fluid mechanics focused on the influence of fluid motion and turbulence on biological systems. Dr. Webster is a Sustaining Fellow of the Association for the Sciences of Limnology and Oceanography and has won numerous awards including the Felton Jenkins Jr. Hall of Fame Faculty Award, the Eichholz Faculty Teaching Award, and the Class of 1934 Outstanding Innovative Use of Education Technology Award.

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Goal of the Activity

In numerous organizations today, *psychological safety* has been identified as a precursor to both individual and organizational learning. In fact, a recent longitudinal study conducted by Google's People Analytics unit showed that psychological safety was the number one predictor of a successful, high-functioning team.

So, what is psychological safety and how can it be used in the design of learning environments? Edmondson (1999) has defined psychological safety as "the shared belief held by members of a team that the team is safe for interpersonal risk taking." More recently, a growing literature has shown links between psychological safety and positive learning behaviors. If a learner feels safe to voice an opinion, to ask a question, to claim a knowledge gap or to try something he or she is unsure of without fear of ridicule or rejection, the opportunities for learning are enhanced. Of particular importance and relevance to engineering education, psychological safety has also been shown to be helpful in having learners understand how to use failure as the starting point for learning (Carmeli et al. 2009).

In many postsecondary educational settings, where class sizes are generally twenty-five or more, students are wary about asking questions, voicing opinions, revealing knowledge gaps and misunderstandings, or taking risks for fear of peer ridicule or rejection. And yet, this fear diminishes opportunities for doing the key things that are the starting points for learning. In this context, our goal is to design a learning environment in which students feel safe enough to admit and embrace misunderstandings and failure, to ask questions, to work closely with learning mates, and to respect peers.

Description of the Activity

As we have described in previous publications, the intervention is to transform the learning environment in undergraduate engineering mechanics courses to a blended pedagogy (Webster et al. 2016, 2019, 2020). These courses, such as Fluid Mechanics and Engineering Dynamics, often have reputations among students of being highly challenging, and students are often apprehensive and intimidated when entering the course. The course design is to use emerging technologies to effectively move the traditional lecture content to

outside the classroom. This opens the possibility to reimagine the classroom experience and create a safe learning space in which the students feel secure and confident to explore and learn.

The in-class environment is the key. When students arrive at the session, the instructor typically starts a problem-solving exercise on the board. This provides a collective beginning to the session, addresses gaps that remain in understanding from the on-line lecture content, and allows for collective participation and questions from the class. After ten minutes, the instructor releases the students to work in pairs to complete the exercise and work on additional exercises addressing the daily topic. The exercises are sequenced in increasing order of difficulty, so the students can progressively build proficiency and confidence. The instructor and teaching assistants roam the room talking to the student teams. This most often takes the form of the student team asking questions about a step in the problem solving on which they are stuck. The term "just-in-time tutoring" is appropriate since the students are situated at the moment when they are most receptive to receiving insight or a hint from the instructors. It is very common to have the students respond with an "ah-ha!" moment of discovery as they figure it out. At the end of the session, student work is neither collected nor assessed; the only direct impact on the students' grade is attendance/participation credit.

Reflection on How This Activity Meets the Author's Goal

The in-class format succeeds in creating a psychologically safe environment. For instance, the students express more security in asking questions. The intimacy created in dyads encourages open conversation and negotiation about how to approach the exercises. Students also feel less inhibited to ask for help when stuck or confused. Further, they do not feel pressure to complete the assignment (during the session, at least) and are not motivated to circumvent independent problem solving in order to achieve a score. One student expressed this perception in the course survey: "Every lecture, we speak to each other, the TAs, and the professor. This opportunity to talk about what we understand helps us bridge the gaps of misunderstanding and confusion."

When compared to a traditional lecture course (by the same instructor), the students report a significant increase in amount learned, the degree that the assignments facilitated learning, and the effectiveness of the course (Webster et al. 2020), again reflecting the students' perception of psychological safety. In this regard, the students appear to understand the opportunity to make mistakes during the class session in order to learn from those missteps and perform at a more proficient level during the summative assessments (i.e., exams).

We also have suggestions in the student achievement data that female students gain more in the blended classroom (Webster et al. 2020). This indicates that members of a traditionally under-represented group in engineering, in this case women, feel psychologically safe to explore and, ultimately, succeed in the course. When one feels that they belong, it is much easier to ask questions and build confidence and proficiency. Indeed, the sense of belonging follows naturally from working with a single partner during the semester and readily receiving just-in-time tutoring from the instructors.

As a closing thought, we present another student survey comment that captures many of the ideas above:

> *WOW! Honestly when I signed up for [Fluid Mechanics] I was scared from the stories I had heard from recent students. This class was nothing like I expected. Granted it was still a challenging course that required studying and work, but the professor did a great job in preparing all of his students for homeworks and tests. I loved the class structure and found it so much more effective than a regular classroom. A lot of students learn better by doing examples, NOT taking notes. Having the lectures online also allowed us to go back and re-listen to any of the things we have trouble with. Great class, great instructor and I have ALREADY told all the young engineers I know to take [the course].*

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Simple Experiments Aren't So Simple, But They Can Be Sweet!

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Author Biography

Kimberly Shaw, Ph.D., is a Professor of Physics and the Co-Director of UTeach Columbus. She was awarded the 2015 Council for the Advancement and Support of Education Georgia Professor of the Year Award, as well as an award from the Southeastern Association for Science Teacher Education. She teaches courses in physics, as well as the Research Methods course for the UTeach program. Her focus within the field of physics education research is on determining factors that promote the success of female and minority students, and supporting improved learning outcomes and retention of all students in STEM.

At Columbus State University, students in majors leading to teacher certification in science, math or computer science as undergraduates are a part of the UTeach Columbus (2019) program, modelled on the highly successful UTeach program created at the University of Texas. UTeach programs seek to provide streamlined programs of study that will both train secondary education majors to be effective classroom teachers with experience in active, inquiry learning, and to have a strong content background that would also qualify them for graduate programs or careers outside the classroom. Majors take the Research Methods course, which has student learning outcomes that include designing an experiment, collecting and analyzing data, creating scientific arguments, communicating research, and applying these understandings to the teaching of STEM in a secondary education setting. All of these learning outcomes provide discipline-specific windows into critical thinking skills that our graduates will use.

One unit of this course prepares our students to work on an independent research project. It begins as students are posed a research question, with the goal of touching on each of these student learning outcomes and providing practice in these techniques before larger individual projects are assigned: "How many licks does it take to get to the center of a TootsiePop®?" Students are excited to have an easy assignment, although discussion often begins with a "Can we eat the candy? Do we *have* to?" discussion. The class brainstorms in order to design the experiment and immediately confront several complications: does using an alternative method (a wet sponge) give an equal result to human saliva? Do two different people lick the same amount of candy? As a result, students quickly determine the need to define terms explicitly as a part of the overall design, and the importance of communicating those definitions clearly. This use of critical thinking allows student-developed replicable design and communication of results, both course outcomes. For example, students realize they must define the "center" and a "lick" in order to have replicable outcomes.

Discussion includes what variables are controlled, measured, and what may be confounds. Students also discuss whether the impact of how much an individual likes a flavor may have on how much candy is removed with each lick. It is also discussed that saliva and water may impact different candy flavors differently, but that question is deferred for later study. Students also discuss how many "centers" must be reached in order to have a reliable conclusion, allowing a brief introduction into sampling and statistical analysis which will be addressed more fully later in the semester. This aspect of the discussion, relying on student critical thinking skills, is important as the class determines what factors are needed for reliable and generalizable results, as well as a deeper discussion of the limitations of their conclusions.

Further brainstorming to determine the experimental design now focuses on standardizing procedures. Students discuss a standard number of licks to take before recording and taking either a sip of water, a mouth rinse, or (for those who do not wish to eat the candy) to rinse the sponge, and develop a protocol for recording data. In order to deal with potential variations in how much candy different individuals remove

with each lick, each candy has its' initial mass recorded, and its' final mass. Students typically choose to determine whether or not there are individual differences by calculating the ratio of mass removed to number of licks.

At this point, students typically acknowledge that a simple question does not necessarily mean that the procedure will be simple! They have addressed questions of terminology, of sample size, of replicability of data collection and of individual variability. They have determined controls that will be implemented, and begun to think about ways to analyze the data.

During data collection, discussion diverts to classroom management issues for these future teachers. How would this project change in a classroom with younger students, or older students? How much latitude do you allow a class with good behavior, or bad behavior? Why should you not *require* people to eat the candy? What constraints might be placed on the class design of this experiment, they conclude, should be based on the context in which they are teaching. Further, the class discusses how they might constrain an experimental design rather naturally, by limitations through available materials or class rules, in order to maintain a productive classroom experiment.

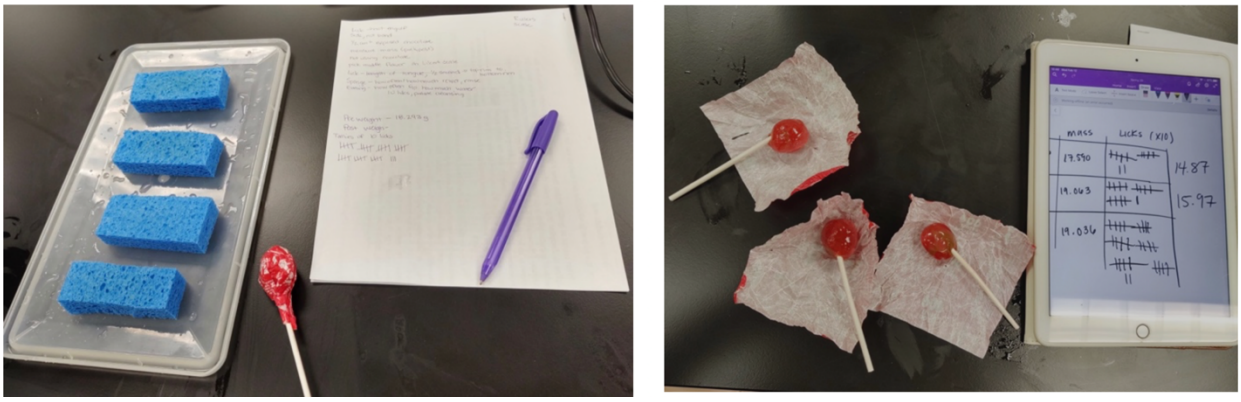

Figure 5: Data collection setups of two students, representing several modes of data collection (licking vs. sponges)

Students each reach the center of 2 – 3 candies, and the preliminary data (initial mass, number licks, final mass, and mode of removal) are recorded. At this point, the class reflects on prelimary results as a means of approaching the iterative nature of the experimental design process and determining which procedures are in need of further revision. For example, students often assume that the candy will be uniformly shaped, and find that there is significant variation in the thickness and symmetry of the candy from one piece to another. If the procedure is modified, the class discusses if any preliminary data can be kept and used with the data from the newer procedure.

Once students have collected their data, data analysis begins. Analysis includes whether individuals are consistent in the amount of candy they remove per lick, and how much mass on average is removed in order to reach the "center".

Pre Mass (g)	# licks	Post Mass (g)	Difference	Method	Person	Flavor
18.293	380	15.490	2.803	Sponge	ES	Orange
17.212	220	14.636	2.576	Sponge	ES	Orange
17.812	280	14.500	3.312	Sponge	JS	Orange
17.246	240	13.810	3.436	Sponge	JS	Orange
18.944	323	16.821	2.123	Sponge	MG	Orange
17.162	410	14.438	2.724	Sponge	MG	Orange
18.676	730	12.801	5.875	Tongue	LW	Orange
17.532	770	13.279	4.253	Tongue	LW	Orange
17.590	120	14.800	2.790	Tongue	EC	Cherry
19.063	160	15.970	3.093	Tongue	EC	Cherry
19.036	320	12.230	6.806	Tongue	EC	Cherry
17.610	240	13.770	3.840	Tongue	AO	Grape
17.020	190	14.160	2.860	Tongue	AO	Grape
19.358	217	14.826	4.532	Tongue	LC	Raspberry
18.817	182	14.911	3.906	Tongue	LC	Raspberry
17.632	300	14.145	3.487	Tongue	NL	BlueBerry
18.057	310	14.250	3.807	Tongue	NL	BlueBerry
307.060	5392	244.837	62.223	Total		
18.062	317.1765	14.402	3.660	Average		

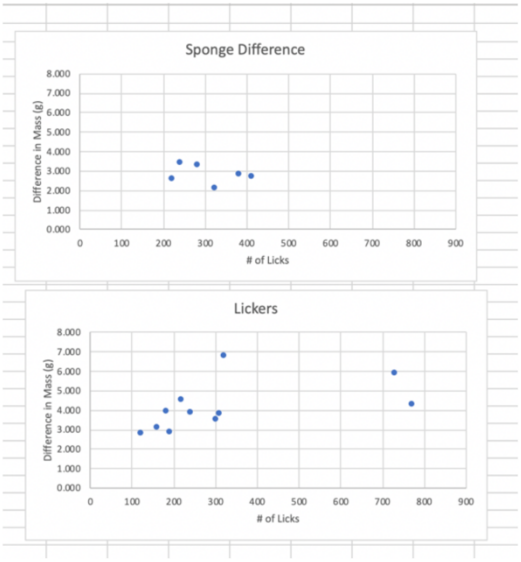

Figure 6: Preliminary data analysis from Spring 2020, led by students.

After analysis, the unit moves into its final phase: argumentation. In a prior class exercise, students have been introduced to the claims-evidence-reasoning model (Grooms, Enderle, Hutner, Murphy, & Sampson, 2016) of argumentation. Using this structure, each student is responsible for writing a paragraph which clearly communicates their claim about the data, cites the data as evidence, and then connects the data to the claim. Class discussion, in which several different conclusions have been reached, further allows students to provide constructive critiques and deepen their understanding of the limits of the data, and how further refining the experimental design might allow better data collection.

At the end of this unit, the class has worked together to strengthen their critical thinking skills as they apply to scientific inquiry and communication. By modelling this process of scientific inquiry from beginning to end, several course goals are achieved. First, students are able to experience the revisions that typically occur in the scientific method, more closely modelling true research. Second, students are able to design experiments, and have normalized the idea that changes to procedures are to be expected, and not a sign that they have done something wrong. Further, by working on this experiment as a class, they are all now better prepared for their individual STEM research projects, which serve as a longitudinal assessment of the learning gains for this portion of the course. And by providing practice in the steps leading to scientific argumentation, students are better prepared to write their own arguments, and to critique the arguments of others.

Students typically report having enjoyed, and learned from, this unit a great deal – although few are eager to eat any TootsiePops for the rest of the course. And while the details of this unit are specific to STEM majors, faculty from any discipline can choose a simple question that has a not-so-simple research project – to get to the sweet spot of developing critical thinking skills.

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Playing Video Games in the Classroom: Simulating an Experiential Learning Cycle to Teach International Affairs

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Jeffrey Berejikian is a Josiah Meigs Distinguished Teaching Professor at the University of Georgia. He offers a variety of courses in foreign policy and international affairs across a broad range of formats including large introductory courses, special topics, FYOS, and graduate-level seminars. His classes examine the role of cognitive decision making in foreign policy behavior, which is also his primary research interest.

The Instructional Challenge

There are two inherent obstacles to effective teaching in the discipline of International Affairs. The first is familiar to many programs. As students enter the major, few have had any real exposure to the subject matter. In international affairs, issues like nuclear deterrence, globalization, or diplomacy seem remote and students initially struggle to see a connection between their studies and their future work. The second is more specific to our discipline. Undergraduate students typically cannot practice actual foreign policy decision making while they are in residence on campus, and not all students have the financial resources to pursue highly competitive—often unpaid—internships during the summer.

The challenge here is to replicate a traditional experiential learning environment through simulation in a way that encourages students to practice and hone the skills required of them as they begin careers as a foreign policy professional.[2]

Solution

One way to address this challenge is to develop foreign policy simulations using off-the-shelf video games. The purpose here is to create a "simulated experiential learning cycle" in the classroom on topics, like foreign policy, that do not otherwise lend themselves easily to active learning. In this class, students create, implement, and evaluate various foreign policy strategies.

We currently use a version of Civilization IV. The game is "open-ended" in that there is no single objective for players. Student-teams manage assigned countries with varied political, cultural, economic, and geographic characteristics. They pursue their government's national interests through a variety of strategies that result in both cooperation and conflict.

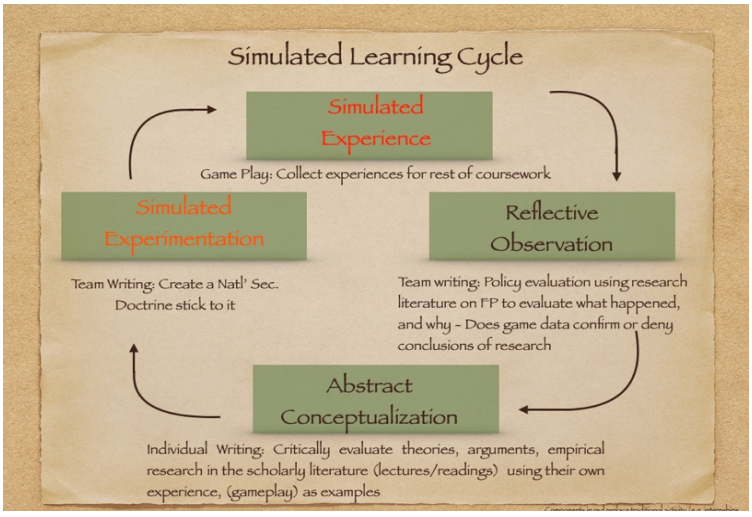

Figure 7: The adapted "simulated" experiential learning cycle and associated classroom activities.

[2] For a summary of the experiential learning cycle, see Kolb, David A. *Experiential learning: Experience as the source of learning and development*. FT Press, 2014.

The primary benefit of computer games is that they motivate aspects of real foreign policy decision making that are difficult to reproduce in a traditional classroom. Students compete to accomplish their goals simultaneously, under acute time pressures, while confronting significant complexity. Because commercial games are designed to be engaging, they provide an immersive experience that is otherwise difficult to manufacture.

Course Structure

The course meets in a single three-hour session each week, divided into three blocks. In the first block, we discuss the readings and their potential significance to the simulation. The second block involves gameplay in which student teams play their country roles. The third block is a debrief. We summarize what happened in the game and critically evaluate how the readings did (or did not) relate to decisions in the simulation. This format forces students to continually integrate the academic course material into their role-playing.

Keys to Success

In a well-designed simulation, students spend most of their time engaging in diplomacy and negotiation outside of the game itself. This encourages students to experiment (and often fail) with the strategies and concepts presented to them in class. The game sets the environment, crates challenges, and is the mechanism by which they implement decisions and observe their consequences. While the details would be different, the basic design concepts below would apply to any semester-long immersive simulation:

Develop a Modular Syllabus

It is critical to align reading material with the real-time student experiences in the simulation. Some semesters are characterized by conflict, others by cooperation. Often the focus shifts across issues within a simulation as it evolves. Developing a modular syllabus ensures that the academic material remains relevant to the content of gameplay. Modularity requires instructors to adapt on the fly, removing readings and replacing them with relevant material. This also ensures that students are reading about the challenges they are experiencing in the game, and so the experiential learning cycle remains intact.

Integrate Game Experiences into Every Assignment

A traditional exam in a foreign policy class might ask students to apply course concepts to the behavior of a country that they have never visited. By contrast, in this class, students use the simulation to evaluate the integrity of course concepts against *their actual behavior*. Compared to the decisions of a government that they may have read about in a textbook, students are much more intimately familiar with the motivations of their own choices and so they have more "data" to confront the concepts offered in class.

Teach beyond the Syllabus

Every student team is experiencing a different "reality" in the game with a unique set of challenges and potential solutions. While there is a set of shared concepts that all students must master, each team also needs a unique set of skills to solve the problems specific to their country. Much of the vital teaching, therefore, involves topics that never show up on the exam. However, if every assignment (below) is connected to the simulation, then students can integrate this material into other aspects of their coursework. To some degree, this also means students will emerge from the class with different skills and experiences. That is fine.

Detach Game Outcomes from Course Grades

The first question students often ask is, "What happens if I lose? Will I fail the class?" Therefore, students must understand that the game outcome has no bearing whatsoever on their grades. This is now the first thing I communicate on the first day of class. It is essential not just for students who might not have experience with video games and are therefore understandably anxious. It also tempers the expectations of

overly-enthusiastic "experienced gamers" who might focus too much on game mechanics and neglect the actual purpose of the class.

Assignments

Assignments should be writing-intensive and designed to mirror activities that students would undertake outside the classroom. In addition, each exercise must encourage students to deploy course concepts to understand their simulation experience. While the range of possible assignments is varied, the following serves as a core around which additional work can be organized:

National Security Doctrine (NSD): After studying real-world examples to model, student teams design NSDs tailored to the unique mix of characteristics—i.e., political institutions, economic organization, culture, and national power—for their assigned country. A key component in this assignment is that students must attempt (and often fail) to design a foreign policy strategy without being able to anticipate the specific future challenges they will confront in the game - a valued and critical skill.

Evidence-Based Policy Analysis: At key junctures in the semester, student teams evaluate the success of their NSDs. This assignment serves two functions. First, it confronts students with a difficult, real-world task: derive objective measures to assess the success of policy goals that often defy simple quantification (e.g., "support democratic values" or "increase global influence"). Second, students must explain policy successes and failures in terms of the academic concepts they receive in class. This encourages them to deploy their academic training as a guidepost for evaluating their own decisions and experiences.

Traditional Testing: Individually, students must demonstrate mastery of core concepts. Examinations ask students to use their decisions in the game as "data" to test and critique core concepts.

Elite Interviewing: At the end of the simulation, students receive training in conducting structured interviews - an important data collection skill in itself. They then interview each other to understand the decisions and motivations of other countries in the game. Appreciating a foreign policy issue from your rival's perspective is a critical skill in effective diplomacy. During interviews, students are often shocked to find that their counterparts perceived shared challenges from a radically different point of view.

Beyond all of this, when students are given responsibility for dictating how a simulation unfolds, their level of engagement increases, their learning improves, and everybody has more fun.

Personal Narratives:
Changing Attitudes and Actions One Story at a Time

Rebecca E. Burnett
Georgia Institute of Technology

Author Biography

Rebecca E. Burnett, PhD, is Professor Emerita in Georgia Institute of Technology's School of Literature, Media, and Communication, where she held the Class of '58 Professorship of Writing and Communication and served as Director of the Writing and Communication Program. She taught visual rhetoric and technical narrative. Her research continues, focusing on assessment, collaboration, digital pedagogy, multimodality, leadership, risk communication, and technical discourse. The University System of Georgia Board of Regents has recognized her with the Felton Jenkins, Jr. Hall of Fame Faculty Award for the Scholarship of Teaching and Learning.

At Georgia Tech, students are surrounded by logic, by verifiable evidence, by carefully designed lines of argument, by tightly argued cases. However, in the world outside the academy, many audiences are likely to be influenced by emotion rather than logic. In fact, some audiences dismiss—even distrust—science as the basis for beliefs and decisions. *LMC 3408 Rhetoric of Technical Narrative* is a semester-long course about using narrative to convey technical and scientific information. Throughout the course, students learn to use verbal and visual narratives to translate and transform information from technology, science, and social science for general, non-expert audiences.

Both academic literature and mass market literature include considerable discussion about the role of narrative and the value of stories in the community and the workplace: articles to counter bullying, to reduce sexism and racism, to strengthen team function, to improve patient-caregiver relationships, to reduce workplace injuries. Further, journalists often use narrative strategies to frame news events: microplastics, food safety, manufacturing glitches, inspection violations, mud slides, water pollution, identity theft. In short, narrative is a powerful tool for educating non-expert audiences about technology, science, and social science.

On the first day of *LMC 3808, The Rhetoric of Technical Narrative*, students learn that in the public arena, logical argument often loses to emotional argument (see sidebar). Narratives are a powerful and effective way to present information, to embed facts so that audiences become intrigued with ideas they might otherwise resist or even reject. Narratives engage audiences—educating them about ideas, contextualizing information, and moving them to new ways of thinking. Thus, for our students, learning to tell effective stories is important because many audiences are more likely to be influenced by emotion than by logic.

Types of Argument

Logical argument—What is called "rational argument" uses facts and evidence-based reasons to influence or persuade an audience.

Emotional argument— What is called "irrational argument" uses stories and emotions to influence or persuade an audience.

Personal narrative

While learning to tell stories about sensitive, technical, and difficult subjects in the workplace and community is challenging, it's an important ability. Throughout the course, students learn to translate and transform information from technology, science, and social science for general, non-expert audiences. For the final project in this course, students create and record a personal narrative. The purpose of this assignment is synthesis—to incorporate storytelling, argument, collaboration, writing, orality, technology,

and self-, peer, and audience assessment. In the end, if students can effectively tell a slice of their own story, they are very likely to be able to tell others' stories.

Preparation

Students prepare for creating and recording their personal narratives in a number of ways that encourage them to develop confidence that they have something of merit to say. The preparatory processes are generalizable to future academic, community, and workplace activities.

- *Recognize that effective stories are often multilayered*. Listening to the TED Talk of Nigerian novelist Chimamanda Ngozi Adichie helps students learn to value the complexity of their own lives, to understand that hearing a single message about another person risks misunderstanding.
- *Develop strategies of storytelling*. Participating in a workshop with guest speakers from Georgia Tech's Transformative Narratives Initiative helps students learn to craft a personal story that moves an audience. Alternatively, go to https://sdie.gatech.edu/transformative-narratives to read about the Transformative Narratives Initiative and listen to examples of moving narratives.
- *Learn the basics of timing, recording, and editing*. Participating in a podcast workshop with one of our Georgia Tech librarians introduces students to useful podcast processes and tools (e.g., in thank you notes to the guest speaker, students often mention benefits of the Audacity editing demo).
- *Think about approaches*. Writing weekly blog posts analyzing ways narratives convey critical concepts reinforces various approaches adaptable to their own storytelling.
- *Apply course concepts*. Reading and following the assignment sheet reminds students to take intellectual risks and consider ways to apply some of the core course concepts (see sidebar).
- *Write a memo proposal*. Defining and scheduling (with a Gantt chart) the creation of a personal narrative—particularly one that involves a physical, intellectual, emotional, financial, or social risk—applies all the concepts and strategies of the course.

Influential Concepts and Strategies

Prior knowledge—previous beliefs, education, and experiences that necessarily influence the ways you perceive and interpret new information

Re-mixes—creating new or different versions of a recording (usually a video or song) by deleting from, changing, and/or adding to the original

Translation—Adapting information for a new audience (e.g., translating information in a medical journal to a mass market newspaper; translating an aerospace engineering drawing for nonexperts watching CNN)

Transformation—Changing and reshaping ideas or information—that is, changing *genre* (print to web), *scale* (thumbnail to poster), *medium* (live demo to video), *mode* (from written to oral), *scope* (manual to tip sheet), color palette (4-color to B&W), or *pace* (self-paced to auto-paced PPT)

Transference—Applying/generalizing communication strategies from one context or situation to another (e.g., transferring appropriate use of metaphors from academic to workplace situations)

Creation and Presentation

Students create and refine a working outline (a sequence of elaborated talking points with production notes rather than a word-for-word script). The personal narratives are typically between 10-12 minutes. Students practice—and practice more—before recording and editing their personal narrative using strong storyteller strategies. Some students add music and/or sound effects; others have silence as the background. In the process of creation, students collect feedback on their story drafts and revise based on their interpretation of that feedback. Students present their final personal narrative orally in class and also record their personal narrative, which is made available to their classmates and the instructor.

Reflection

Throughout the course, students practice various kinds of reflection as a critical part of learning. Following the presentation and posting of their personal narrative, students create three reflective documents.

- *Create an artist statement*. Earlier in the course, students learn that designers, developers, and artists often create a statement to accompany an artifact—a statement that presents information such as the philosophy of the designer, the intention of the artifact, and approach used in the artifact's development. Students report that this artist statement helps them articulate their aesthetic intentions and explain their narrative's purpose, process, and philosophy.
- *Prepare a user-test report*. At various stages in the development of their personal narrative, students try it with test audiences (anywhere from two or three to a half-dozen listeners who provided feedback about the draft/in-process versions), record the reactions and suggestions, and revise to improve the narrative. The user test report describes the benefit of the testing, summarizes the test results, interprets and reacts to the results, and describes changes in the narrative as a result of testing. Students report that this activity gives them a new way to think about and practice user testing, which is a critical professional strategy for many of them.
- *Compose a self-assessment*. Student are given a list of 20 topics that serve as fodder for reflection; they're asked to select two or three for discussion. They're also asked to discuss (a) the *intellectual merit* of their narrative—that is, how their personal narrative might advance knowledge, improve understanding, and/or bring about changes in beliefs and/or actions and (b) the *broader impact* of their narrative—that is, how their personal narrative might benefit society and/or serve people who have been in some way underrepresented or misrepresented. Students report that this self-assessment challenges them to think about their narrative project more broadly and consider its potential long-term value to others.

Students often include their personal narrative (and some of their ancillary documents) in their professional portfolio—as a model of the high-quality work they can produce.

Extension

This personal narrative assignment can be adapted to other purposes and classes. Consider these possibilities: adapt the *processes* of the assignment in part or in their entirety (preparation, creation, presentation, and reflection); adapt the *components* of the assignment in part or in their entirety (storytelling, argument, collaboration, writing, orality, technology, and self-, peer, and audience assessment); adapt the *purpose* of the assignment by using narratives other than personal stories to convey information to non-expert audiences; adapt the *concepts* (re-mix, translate, transform, transfer) that undergird the assignment to other situations.

Building Student Community through a "Drop-In Salon"

Monica Carol Miller
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Author Biography

Dr. Monica Carol Miller is an assistant professor of English at Middle Georgia State University. Her first book is Being Ugly: Southern Women Writers and Social Rebellion.

Goal

I wanted to find a way to encourage students to attend office hours. Much of the scholarship of teaching and learning emphasizes the importance of meaningful faculty-student interactions; surely, there's a way to capitalize on office hours for this. I was also responding to a request by students in a hybrid writing course I was teaching: as the next course in the program that most of them were taking was online, they asked if I could arrange a space for them to meet informally in person the next semester, voluntarily, to maintain the community that we had built.

Background

Faculty and institutions have tried various strategies to encourage student attendance of office hours, from using various digital tools such as Google Hangouts to creating humorous videos about the wonders of office hours.[3] Still, students continue to be reluctant to attend, despite these additional access points. One study about student perceptions of office hours notes that students were reluctant to attend office hours because they were unclear about their purpose (Smith et al., 2017, p.18) or "perceive[d] office hours as fulfilling only a single purpose, that of addressing emergency situations" (Smith et al, 2017, p. 19). Indeed, we are all familiar with such student meetings, whether about failing grades, looming deadlines, or emergencies in students' personal lives.

However, the study also notes that, ideally, office hours offer opportunities to "foster desired outcomes of higher education [that] both encompass and extend beyond questions about specific course material; they may include, for example, mentorship, discussion of a students' future plans and career trajectory, [or] fostering student persistence" (Smith et al., 2017, pp. 18-19). Such interactions are an important part of the social aspects of learning. Joshua Eyler identifies three elements central to such "social pedagogy": "a sense of belonging, a focus on community building, and a teacher who models effective intellectual engagement" (112). In an attempt to foster all three, I sought to create an activity that would both act as an informal supplement to traditional office hours as well as normalize student-faculty interactions so that students might feel more comfortable seeking out other faculty interactions (and attending traditional office hours).

Application

With my all of this in mind, I worked to create an activity that would foster community-building and engagement through faculty-student interactions outside the classroom. While I still have regular office hours in my faculty office, I also reserved a small conference room in the library for an hour each week. Having a regular space in the library--away from my office and the classroom--allows for a different kind of faculty-student interactions. Given my fondness for certain portrayals of old-school academia--with tweedy professors and tea--I decided to call it a "drop-in salon" and offer tea and cookies.

I put the following in all of my syllabi:

[3] Arizona State's "Introducing Faculty Office Hours" YouTube video was even featured on NPR's *All Things Considered* (Baker, 2019).

> This semester, I'm going to be having what I'm calling "Drop-In Salon Hours" in the library. On Tuesdays from 1-2, I'll be in the library with tea and snacks, and all of my students are invited to come by and read, chat, ask questions about their classwork, or talk to other students. You don't need an appointment, and you don't have to stay the entire time. I've had students request more informal, social time to talk about class readings as well as other things, so this is an experiment I'm trying this semester. Let me know if you have questions.

I encouraged students in all of my classes--which include two face-to-face sections of first year composition, a face-to-face survey of American literature class, and the fully online professional writing class--to come by if they were free. Each week during the Spring 2020 semester, I have held these Drop-In Salons (bringing an electric teakettle, tea, and cookies to the library with me). Every week, I have had at least a couple of students attend--and they haven't only been the students who requested it. While the online students have been the most regular attendees, I have had students from all of my classes attend, not only with questions that they might bring to traditional office hours--such as help with rough drafts for class or about course registration--but also to discuss books they're reading for pleasure, their career paths, and extracurricular activities.

Pandemic Update and Reflection

Before the pandemic, I found that emphasizing the salon's informal nature seems to have especially encouraged first year students to attend, who are generally wary of seeking out my office. Further, one of the unexpected outcomes has been the interactions between students from different classes. For example, when a first-year student asked about visiting the Writing Center, one of the other students present was a Writing Center tutor, and she walked him through scheduling an appointment online right then. Many of these students juggle childcare, outside jobs, and other responsibilities; this informal setting has allowed them to share experiences with students they otherwise might not have met. I also appreciate the insights into their lives which this informal setting has allowed.

Importantly, this community continued through the shelter-in-place orders, even after all classes moved online. Because our students have very uneven access to resources—especially wi-fi and computers—synchronous class time was simply out of the question. However, with access to Blackboard Collaborate through D2L, I set up online office hours through videoconferencing at the same time that I had been holding drop-in salon hours. I was pleased that the same students attended online who had attended in person—both the students from the online class as well as students from Survey of American Literature and First Year Composition. I was glad that several students used the online office hours for their traditional purpose, asking questions about their assignments as well as wanting to talk more about the lectures I recorded and the texts they were reading.

One of the students had contracted COVID-19, and she would attend these video office hours to keep us updated about her and her family's state of health. Having this connection allowed me to put her in touch with my colleagues who had information about material resources which might help her and her family during the crisis. Another student's husband had been deployed to the Middle East at the beginning of the semester, and during the shelter-in-place orders was juggling her schoolwork, babysitting her grandchildren and assisting with their online schooling, and worrying over her husband's safety and health. Each week, she and other students compared experiences with their children's online education and other anxieties. The joy that we were all able to share at the news of her husband's surprise homecoming was as marvelous as our shared relief at her classmate's recovery from the virus.

Before the pandemic, I found the drop-in salon to be a way to foster student engagement and community in an era of shrinking resources for faculty, students, and institutions. In the midst of such an unprecedented crisis of Spring 2020, I am glad that I had begun this informal community-building already, so that I was

able to use it as a foundation for the sudden move online during the COVID-19 crisis. As we move forward into the uncharted waters of higher education during a pandemic, I continue to seek out ways of forging community with my students.

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Using Learning Assistants as a peer learning model to increase student success in Principles of Biology laboratory sequence

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Author Biographies

Dr. Barbara Musolf is currently an Associate Professor of Biology at Clayton State University. She has worked at developing the course-embedded undergraduate research experiences (CUREs) in the introductory biology sequence and is one of the program coordinators of the learning assistant program at Clayton State University.

Dr. Ann M Showalter is an aquatic ecologist who received her PhD from Miami University in 2016 She has been working on incorporating evidence-based teaching practices, which has led her to focus on developing course-embedded undergraduate research experiences (CUREs). Dr. Showalter is currently one of the program coordinators for the learning assistant program at Clayton State University.

Dr. Paul Melvin is an Associate Professor of Biology at Clayton State University. He earned a PhD in Biology from the University of Alabama at Birmingham, with a focus on environmental toxicology and endocrine disruptors. He teaches courses in molecular biology, general biology, and leads study abroad programs to the Bahamas and Costa Rica.

Goal of the Program

Peer learning models have many benefits, especially within STEM fields (Talbot et al. 2015). One effective peer learning model uses learning assistants, who are students embedded in a course that provide support for student learning in their assigned course, serve as a role model for succeeding in the course, and create an atmosphere of belonging among students. The Department of Biology at Clayton State University developed a Learning Assistant Program with three main goals in mind: 1) support faculty by helping them introduce more active learning in the classroom, 2) mentor learning assistants by helping them develop strong pedagogical skills that strengthen their identity as teachers and scientists, and 3) support student learning in the classroom.

Description of the Program

We built the program initially by incorporating learning assistants into our Principles of Biology laboratory courses, which are course-embedded, undergraduate research, experience-based (CURE) labs, where students work collaboratively to complete a semester-long, authentic research project. The emphasis for CURE labs is to develop students' skills in scientific study design, analysis of data through graphing and statistical analysis, interpretation of findings, and communication of results. Learning assistants play a critical role in developing these skills by working closely with individual students and student groups throughout the semester.

Students who have successfully completed our Principles of Biology labs are eligible to apply to become a learning assistant. The applicants are evaluated on several metrices, including their success in the course in which they will be a learning assistant, their potential and interest in developing pedagogical skills, and their dedication to building a sense of community in the department. Our robust learning assistant program includes the following:

1. Learning assistants receive pedagogical training in a weekly, faculty-led seminar. In this seminar, students learn how to ask probing questions, listen to and elicit student feedback, recognize and

respond to cognitive load, motivate student learning, and encourage students to think about their learning (metacognition). Learning assistants also engage in small pedagogical research projects, which draw from pedagogical theory. The projects are presented at our department and university student academic conferences.

2. Learning assistants are embedded in their assigned course where they guide students in applying the process of science by helping students design research projects and providing feedback as the projects are implemented. They also help facilitate effective collaboration among student groups.
3. Learning assistants hold office hours for students to review faculty-designed formative assignments. Students earn full credit for the assignment if they meet with a learning assistant to review and discuss their answers. Students are not guaranteed full credit if they submit the assignments to faculty to grade. These assignments accomplish two things: reinforce what students are learning in lab and engage them in interactions that provide a greater sense of belonging within the biology community.
4. Learning assistants develop low-stakes, formative assignments for students and gather input on problems that students may be having in the class. The learning assistants use this information, in collaboration with the course instructor, to address student misconceptions.
5. Learning assistants are responsible for guiding students to reflect on what they are learning in the labs, prompting students to develop metacognitive skills and become more intentional, thoughtful learners.
6. Learning assistants are required to meet regularly with the faculty in whose course they are embedded. During this meeting, they review plans for the next class as well as share their observations on student problems in the class.

Reflection on how this program meets the authors' goals

We are pleased with how our learning assistant program is developing, and this past semester we expanded it into two upper division labs and one of the Principles of Biology lecture courses. In addition, the chemistry and mathematics departments joined the program. This supports our first goal, where faculty are now more enthusiastic about including active learning techniques in their courses.

For our second goal, we have observed learning assistants implement pedagogical skills they learn in seminar and develop novel ways to reach students in our lab courses. This past semester they collaborated with faculty in developing virtual formative assignment reviews using Microsoft Teams. By working closely with students and developing their own pedagogical projects (Figures 1 and 2), learning assistants reinforce their understanding of experimental design and improve their identities as scientists.

Finally, we have student-generated data showing that the learning assistants have supported student learning in the classroom, which is our third goal. This is particularly evident in the pedagogical projects the learning assistants have developed as part of their training. For example, data from learning assistant-designed formative assessments show a positive correlation in exam grades (Figure 1), and that student exam scores positively correlate with the number of times they visit a learning assistant (Figure 2). These data, generated by learning assistants, indicate that we are making progress in supporting student learning.

As a result of this project, we have more faculty introducing CUREs into upper-level labs, suggesting that we are introducing more active learning in lab courses. As the program matures, we will begin assessing learning assistant pedagogical skills and hope to encourage more students to consider teaching as a career option.

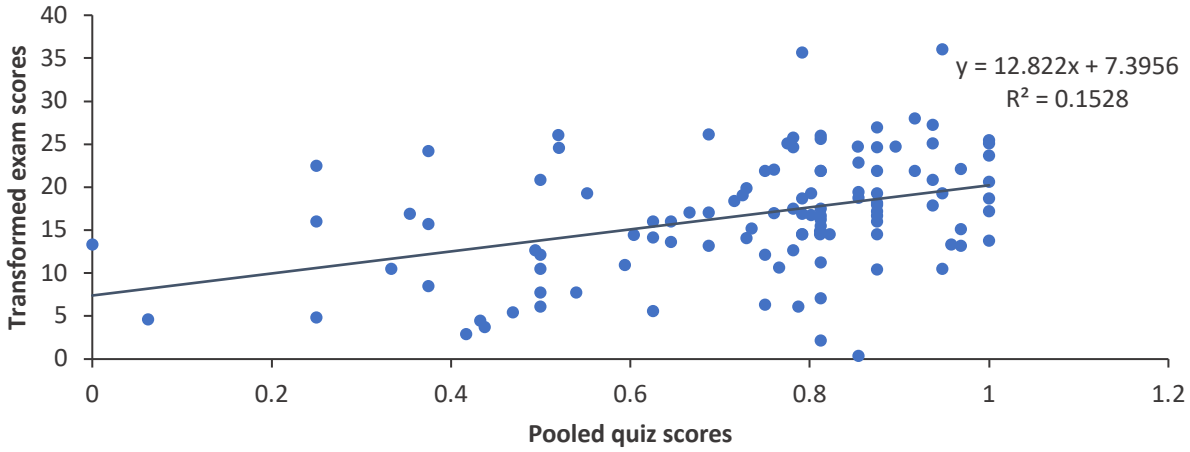

Figure 8: Student scores on weekly quizzes designed by Learning Assistants positively correlates with exam scores (Multiple linear regression, R2 = 0.1528, p = 2.415e-05). Quiz evaluations were not used for course evaluation.

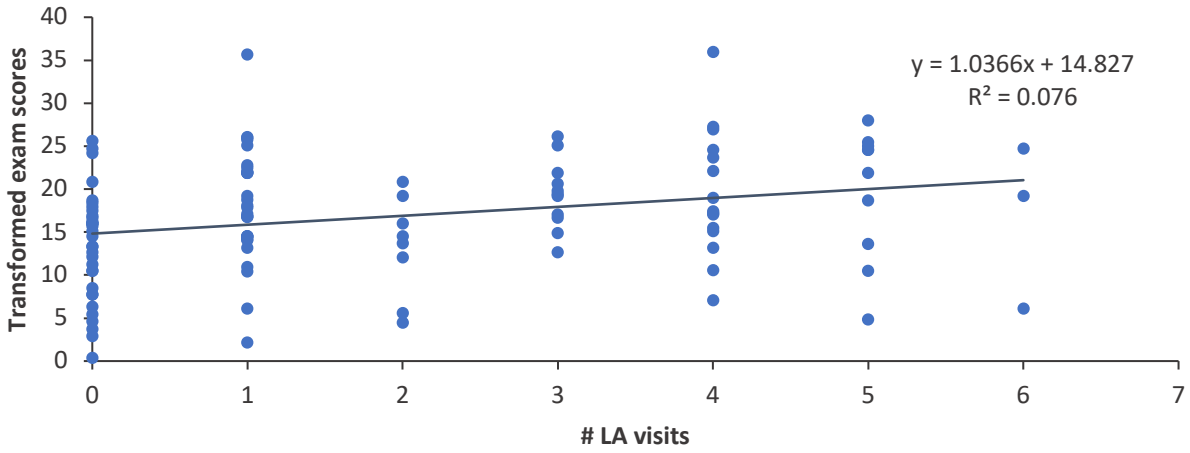

Figure 9: Student exam scores positively correlate with the number of times students visit a learning assistant during office hours (Multiple linear regression, R2 = 0.076, p <0.05).

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Not Your Ordinary Supplemental Instruction: A Focus on Metacognition

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Author Biography

Angela Spencer, PhD, is an Associate Professor in the Department of Chemistry and Physics at Augusta University in Augusta, GA. She teaches courses in general and biological chemistry as well as a supplemental course for students in general chemistry. Dr. Spencer also serves as Director of the NSF-funded S-STEM program, Promoting Opportunities and Pathways for Undergraduate Persistence in STEM (POPUPS) at Augusta University. Dr. Spencer's passion is helping undergraduates learn and excel in the classroom and the laboratory through engaging instruction and mentoring.

In order to improve student retention, progression and graduation at Augusta University, a new course was designed to supplement Principles of Chemistry II (CHEM 1212). The novel course was atypical for Supplemental Instruction (SI) which has been around since the 1970s and generally involves students voluntarily attending a help session led by an SI supervisor, the course instructor, or often, an undergraduate student who successfully completed the course.

The supplemental course (CHEM 1950) is a one-credit, one-hour per week course taught by a faculty member currently teaching CHEM 1212. Students register for CHEM 1950 and receive a letter grade based on their performance on course activities and assessments. Students who are at-risk for earning a D, F or W in CHEM 1212 are recruited for the class. At-risk is primarily determined by a grade of C in the pre-requisite course and/or a failing score on a pre-test given on the first day of class in CHEM 1212. The supplemental course is structured such that students who attend class, participate in class activities, and complete assignments with reasonable success will earn at least a C in the supplemental course. Traditionally, two sections of the course are offered each semester with section enrollment limited to 28 students.

Goals of Course Activities

With an overarching goal of improving student success, the activities in the supplemental course are designed to 1) provide students with needed problem-solving skills through the use of active learning strategies; 2) improve student confidence levels in chemistry as confidence is linked to academic performance and persistence for college students in STEM; 3) provide students with metacognitive practice in order to improve success beyond general chemistry; and 4) ultimately improve success rates in CHEM 1212.

Description of Course Activities

For the purposes of this essay, the focus will be on course activities designed to improve student confidence levels and promote metacognition. These specific course activities include:

- Brief 'lecture' introduction during the first few minutes of class (mostly "Q and A")
- In-class practice problems in assigned groups
- Reading assignments in *The A Game*
- Reading reflections based on *The A Game*

One of the underlying goals of the course was to provide a safe environment for students who struggled in the pre-requisite course (Principles of Chemistry I, CHEM 1211) to work on chemistry problems with their

peers and solicit help from the instructor when needed. The smaller class size and low-stakes aspect of the course seemed to create a relaxed environment where students freely discussed course topics without fear of judgement from others. To further lower anxiety arising from asking questions in front of their peers, students submitted anonymous hand-written questions to the instructor before class. These questions were addressed at the start of class and often ignited an engaging question and answer session regarding confusing problems on pre-class quizzes, tests (in the main course) or homework problems. After this initial Q and A session, students were assigned to small groups (3 or 4 students) for problem-solving exercises designed to assist students in identifying concepts they did not understand. During this time, the instructor moved around the classroom, answering questions and providing answers to the assigned problems with appropriate feedback. The instructor consistently praised the students for their efforts and their understanding of difficult concepts. These aforementioned strategies were implemented in order to improve confidence and metacognition.

To further promote metacognition, students were asked to read Kenneth Sufka's book entitled, *The A Game: Nine Steps to Better Grades*. Dr. Sufka's book is a quick, easy read that provides students with simple solutions for nine common mistakes college students make that hinder their success. In addition, the book highlights effective study strategies and best practices for success. After reading excerpts from the book, students completed reflections requiring an evaluation of their own study practices, test performance(s) and thoughts on the effectiveness of study techniques (their former practices and the new techniques they implemented based on readings).

Reflection

Students were asked to rate aspects of the course on a scale of 1-4 with 4 being very helpful and 1 being not very helpful. Students rated lecturing by the instructor and test reviews (in groups) during class as being very helpful (Table 1). Students rated working practice problems in groups as helpful. According to the students, less helpful aspects of the course were reading and reflecting on *The A Game: Nine Steps to Better Grades.*

Table 2: Results of post-semester survey from fall 2019 relating how helpful students rated each class activity (n = 38).

Class Activity	Average score*
Lecturing by instructor	3.92
Working examples in groups	3.34
Test reviews in class	3.95
The A Game reading	2.42
The A Game reflections	2.29

*Survey scale: 1 = not very helpful; 4 = very helpful.

To provide evidence of confidence gains made during the course of the semester, students took a survey during the second week of classes and again on the last day of class. In every area, the average responses increased from week 2 to week 15 (Table 2). In fact, despite the lower helpfulness ranking for *The A Game* reading assignments and reflections, students reported greater confidence in their ability to use effective study practices at the end of the course. In addition, students reported spending more hours studying for CHEM 1212 and reported using a greater diversity of study methods, including two methods discussed in *The A Game* (concept mapping and notation reduction).

Table 3: Results of survey of confidence levels related to various aspects of chemistry required to be successful in the course (fall 2019 data; n = 41 for week 2; n = 38 for week 15).

Rate your level of confidence in your ability to…..	Average response Week 2* (out of 5)	Average response Week 15* (out of 5)
understand key concepts of chemistry	3.2	3.8
solve chemistry problems	3.3	3.9
visualize key concepts of chemistry	3.0	3.7
use effective study practices	3.1	3.9
apply concepts from CHEM 1211 to CHEM 1212	3.4	3.9
understand new concepts in CHEM 1212	3.2	4.1

*Survey scale: Low = 1; high = 5.

Table 4: Results of survey for study methods utilized by students during fall 2019 term. (n = 41 for week 2; n = 38 for week 15)

Response	Percentage of Student Responses*	
	Week 2	Week 5
group work	26.8%	44.7%
work problems	95.1%	97.4%
concept mapping	9.8%	13.2%
notation reduction	7.3%	42.1%
watch videos	68.3%	52.6%
other**	31.7%	28.9%

*students were instructed to select all that apply
**common responses were review notes and make flash cards

In addition to improving students' confidence in their understanding of chemistry concepts and study strategies, the overarching goal of the supplemental course was to improve success rates in CHEM 1212, targeting those at-risk for DFW, but having open enrollment for any student desiring to take the course. Almost 60% of the students enrolled in the supplemental course earned a C in the pre-requisite course (a potential risk factor) with 30% earning a B and 10% earning an A. In the fall of 2019, 86% of the students enrolled in the supplemental course were successful in CHEM 1212 (36/42) compared to an overall success rate of 77% (83/107) for CHEM 1212. Not only is the supplemental course improving student success in CHEM 1212, student gains in confidence and metacognitive skills indicate that the course activities are achieving the desired outcomes. Future studies are aimed at measuring the effectiveness of the supplemental course on future chemistry course success.

For more information on the activities described for the supplemental course for CHEM 1212, email anspencer@augusta.edu.

Building Community: Using DNA Barcoding through a Collaborative Project Between Lower-Division and Upper-Division STEM Courses

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Author Biography

Dr. Paul Melvin is an Associate Professor of Biology at Clayton State University. He earned a PhD in Biology from the University of Alabama at Birmingham, with a focus on environmental toxicology and endocrine disruptors. He teaches courses in molecular biology, general biology, and leads study abroad programs to the Bahamas and Costa Rica.

Goal of the activity

Building a sense of community and belonging among students within a department can produce many benefits for students, especially in first-generation college students and underrepresented minorities (URMs). Research has shown that student-student connections can impact a student's sense of belonging and lead to increased retention (Strayhorn, 2008; Meeuwisse *et al.*, 2010). This is particularly impactful in STEM courses (Hausmann *et al.*, 2007; Hurtado *et al.*, 2007; Walton and Cohen, 2011; Ballen *et al.*, 2017).

One way to build community and belonging is to encourage students to collaborate on projects. This is made more effective when bringing students of different class standings together by creating situations where more advanced students can serve as mentors for the more junior students. In this activity, I used a combination of field experiences and molecular techniques to bridge the gap between students in lower-division courses and senior undergraduate research students. The goals of this activity were to 1) increase student sense of belonging and community, 2) introduce students to field research, 3) increase student experience with molecular biological techniques, 4) introduce students to bioinformatics and databases, and 5) increase student understanding of biodiversity.

Description of the activity

This activity relies on two different ways to identify a species of plant, animal, or insect – the traditional morphological method where the identifier relies on appearance to identify a species (e.g. using a field guide), or using a molecular technique called DNA barcoding.

DNA barcoding is a method that was developed to quickly identify species and is simple enough to perform for people who are not professionals (e.g. students). DNA barcodes are generated by examining short, but highly variable DNA sequences within specific mitochondrial and chloroplastic genes that vary between species. These characteristics allow DNA barcodes to be easily sequenced and used for identifying a specimen. The gene used for barcoding depends on the type of species you are trying to identify:

> **Animals**: COI gene – encodes cytochrome C oxidase, a component of the electron transport chain
> **Plants**: rbcL gene – encodes RuBisCo, the enzyme used for carbon fixation in plants
> **Fungi**: ITS gene – spacer DNA located between rRNA subunit genes

To generate the barcode, DNA is isolated using a small piece of tissue from the sample of interest using standard, published protocols. Once isolated, the DNA sample is subject to Polymerase Chain Reaction (PCR) using primers to amplify the DNA barcoding region. The primers are not species specific, which contributes to the usefulness of DNA barcoding as the same primers can be used on all samples with the same taxonomic group (animal, plant, or fungi). After amplification, the samples are sent for sequencing,

and the data is analyzed using DNA subway and NCBI BLAST. If the species is already in the databases, the species can be identified. If it is not, the novel sequence can be contributed as a new species barcode.

I turned this into a joint project between two distinct cohorts of students: students enrolled my lower-level study abroad field course and students enrolled in our senior-level research practicum course. The lower-level students in the field course completed a project where they were responsible for collecting samples in the field and tentatively identifying them using field guides, keys, and other traditional materials. Each student was responsible for identifying one species in the field and collecting a tissue sample—such as a leaf, insect, etc.—and preparing it for DNA extraction. Once this was completed, the samples were transferred to the senior-level research students for DNA barcoding. The research students extracted the DNA from each sample, prepared it, and sent it for sequencing. After processing and receiving the sequencing results, the students uploaded the sequences into the database for identification. Once the species identification was completed using the barcoding technique, the two groups of students shared data to see if they had identified the same organism both morphologically and molecularly using barcoding. The students then completed joint research presentations at our research day on their findings.

A DNA barcoding kit purchased from Carolina Biological Supply (item # 211386) is an efficient and affordable way to implement the barcoding activity and was used for this project.

Reflection on project goals

This activity supported the goals of the project:

1) **Increase student sense of belonging and community:** This was a collaboration between lower-level and senior students who worked together on a larger project. By working in groups and completing a joint presentation, students at different points in their academic career interacted with each other in a more meaningful way than they had before.
2) **Increase student understanding of biodiversity:** Students in the lower level field course gained an understanding of biodiversity by identifying species in the field. This incorporated learning about evolutionary relationships, adaptation, taxonomy, and ecological topics.
3) **Introduce students to field research:** Students gained understanding of how field research is carried out, the importance of record keeping and recording observations, and how to process samples for use later in the lab.
4) **Increase student experience with molecular biological techniques:** The senior research practicum students were able to apply molecular biological techniques such as PCR and gel electrophoresis to a real-world study.
5) **Introduce students to bioinformatics and databases:** The senior research practicum students were able to gain experience in using databases and bioinformatics as part of a scientific study.

This project provided a way to demonstrate the power of DNA technology and DNA's importance to all forms of life. It efficiently bridges the gap between broad areas of biology. Because my interest was to facilitate community building between lower-level and upper-level students, I focused on using this activity for that purpose. However, it is easy to adapt for many scenarios, and works between different courses in multiple fields of biology. Because DNA is a unifying feature of life and is of perpetual interest to students, this is a powerful learning activity to use for biology students.

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Engaging Online Learners Through Synchronous Meetings

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Author Biography

Dr. David Glassmeyer is an associate professor of mathematics education at Kennesaw State University. He teaches graduate mathematics and mathematics education courses within the university's online M.Ed., Ed.S., and Ed.D. programs in Middle and Secondary Grades Education. He aims to help teachers increase STEM (science, technology, engineering, and mathematics) integration and ultimately student achievement in schools. As a mathematics education researcher, David focuses on examining and developing teachers' STEM content knowledge at the middle and secondary levels, specifically on teachers' reasoning of mathematics concepts.

During the spring 2020 semester, the COVID-19 pandemic forced USG instructors to quickly convert all courses to remotely delivered instruction. Many of us turned to synchronous meetings, where learners joined class at the same time and participated in a virtual class using audio and video. These meetings often had to occur with minimal planning time or considerations regarding best practices, as we operated under an emergency education mindset.

As we face additional semesters of online learning, an important question is how research-based principles on learning can be used to design and implement synchronous instruction. This essay overviews strategies I have used to facilitate synchronous meetings, with a goal of engaging students through active learning and a sense of community, which can be challenging in an online format (Muljana & Luo, 2019).

Strategies to Facilitate Synchronous Meetings

Select a technology platform to use

My university provides all instructors access to Blackboard Collaborate (Figure 1), which I have happily used for a decade to facilitate synchronous meetings. Your university may alternatively have subscriptions to Zoom or Canvas Conferences. Research and explore the technology platforms available to you.

Determine dates and times to meet

Prior to the start of the semester, determine course synchronous dates and times using student input and include the information on the syllabus, giving as much advanced notice as possible. For example, my students are practicing teachers only available in the evening, after finishing their K12 school day, extracurriculars like coaching, and family obligations. Depending on the course, I have established synchronous meetings ranging from 90 minutes twice a week to 105 minutes once a month.

Establish expectations and norms

During the first week of the semester, establish student expectations by detailing the hardware, software, and features needed for the synchronous meetings. For example:

1. Have the syllabus indicate students will need access to a webcam, headset, and a computer connected to high-speed internet for the course meetings. I have found internet that supports the playing of video (e.g. Youtube, Netflix) is sufficiently fast for Blackboard Collaborate. For students unable to acquire these materials, consider university library and public library resources.
2. Make the first homework assignment due prior to the first synchronous meeting, and ask students to log into the virtual room, test their equipment, and explore useful features.
    - For Blackboard Collaborate, these features include the chatbox, raising your virtual hand, and writing on the virtual whiteboard.

- Have homework assignments that ask students to read articles or complete problems before the synchronous meeting to allow conversations about them during class.

Create a plan for your synchronous meetings

Here are guidelines I use to support student engagement, collaboration, and formation of virtual community:

- Select active learning activities you have already facilitated in face-to-face settings and convert them to an online format.
- Create clear written instructions and goals maximizing the potential of the online environment. I create a PowerPoint presentation that includes space for students to write or type on the board during the synchronous meeting. I use online tools, such as graphing websites, rather than graphing by hand, within the activities.
- Consider possible student responses, solutions, representations, and connections, and how you might facilitate small- and whole-group discussions to ensure a variety of perspectives are considered.
- Practice using features of the synchronous meeting platform and transitioning between activities.
- Create a timeline of how class will go and note contingency plans if things get off schedule.

During the first synchronous session, follow your plan. I use the following structure to foster student engagement, collaboration, and formation of virtual community:

- Arrive 15 minutes before class begins to upload the slides, troubleshoot, and chat informally with students.
- Ask students to log on at least 5 minutes early and double check their equipment.
- Share slides once class begins, launch activities, and place learners into small groups to complete them.
- Have students share audio and video in large and small group settings. Blackboard Collaborate allows up to 6 users to simultaneously share audio and video.
- Pull everyone back together after completing the activity, select a group to present, show their work, and allow the group to explain their thinking and solution to the class.
- Allow peers to respond, extend, and question presentations through the chatbox feature, raising their hand, using polls, and by turning on their microphone and video. Even contributions as simple as chatbox message from a peer saying "great explanation - I hadn't thought of it that way" provides opportunities for student engagement, collaboration, and formation of virtual community.

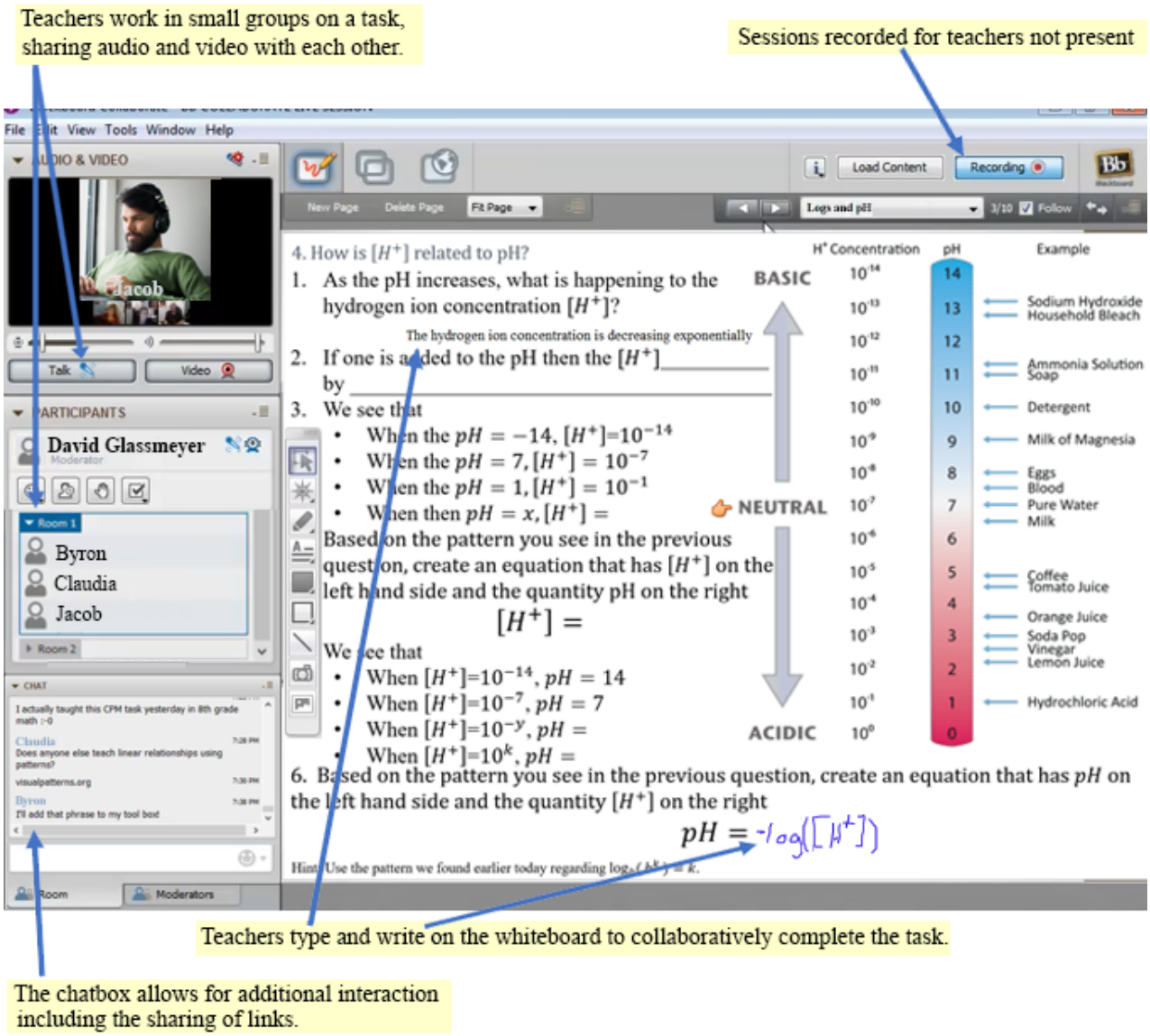

Figure 10: An anonymized example of a synchronous meeting where active learning took place through Blackboard Collaborate Classic, requiring learners to consider how logarithms are needed to describe the mathematical relationship between hydrogen ions and pH.

Feedback

Data from students and colleagues indicate the synchronous meetings were effective in my goal of promoting online learner engagement. Students course evaluation comments include: "*While the course is online, the engagement exceeds many of my previous face–to–face courses.*" A colleague observed that my synchronous meetings "*incorporated several online student engagement strategies including collaborative learning, breakout rooms, and student presentations, which resulted in collective enthusiasm and impromptu discussions about connections to their own K-12 classroom experiences*" (Dr. Anissa Vega). If you are interested in learning more about how to engage learners through synchronous meetings, more detailed and comprehensive information can be found in Fukawa-Connelly, Klein, Silverman, and Shumar (2018) and Glassmeyer (2020).

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Integrating Scholarship, Service, and Global Perspectives: Biology Study Abroad on Andros Island, Bahamas

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Author Biography

Dr. Lauren B. King joined the faculty at Columbus State University in 2014 and is currently an Associate Professor of biology specializing in microbiology and immunology. She regularly teaches courses at both the graduate and undergraduate levels including General Biology, Microbiology for the Health Sciences, Microbial Pathogenesis, and Immunology. She is also highly involved with undergraduate and graduate student research focusing primarily on bacterial pathogens' interaction with the innate immune system and novel therapeutic approaches in multi-drug resistant pathogens.

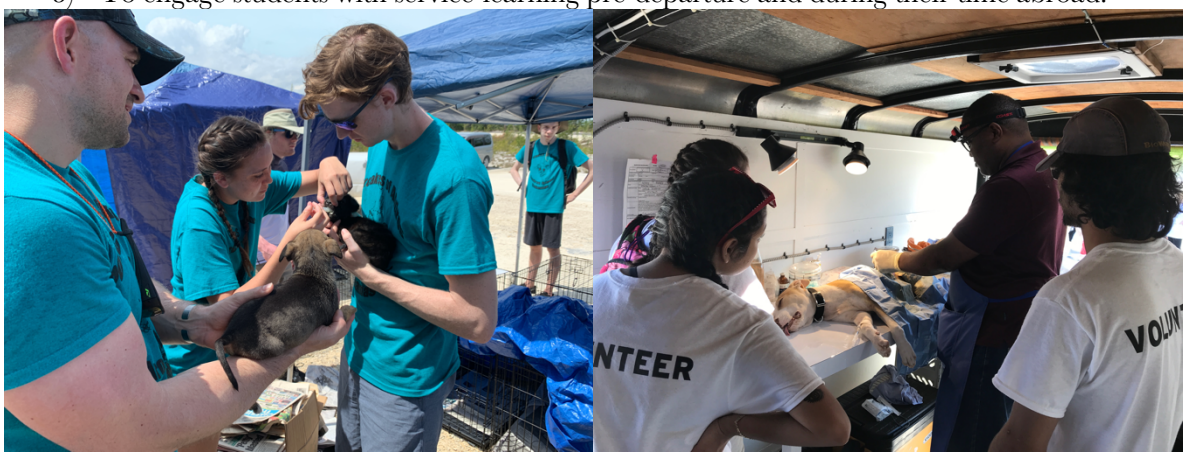
Context

A teaching challenge in STEM fields can be engaging students in a way that demonstrates real-world applicability of the curriculum. Furthermore, some of the more medically-relevant subdisciplines are often limited in their ability to utilize high-impact practices like study abroad and service-learning (Kuh, 2008) due to patient privacy, safety, and limited opportunities for patient interaction. I have developed a course entitled "Contemporary Health Issues of Andros Island" as a medically-focused version of a long-standing study abroad course that travels to Andros Island, Bahamas. In this class, students travel abroad one week over spring break and are given the opportunity to experience human and veterinary medical care in an international context as well as contributing to both through service projects.

Goals

The goals I set for this class are common to many of my classes: I aim to engage students with course material in a meaningful way that not only results in the mastery of set learning outcomes, but promotes passion, excitement, and a sense of personal ownership of the insights, discoveries, and achievements that come about during the course. I aim to give students baseline knowledge of and hands-on experience with human and animal medicine as global concerns by addressing the following mini-goals:

1) To engage students with curriculum centered on human and animal health and disease, including basic microbiology, infectious disease, immunology, and vaccination;
2) To guide students in the design and deployment of research projects relevant to health and disease on Andros Island by collecting either quantitative or qualitative data both pre-departure and while abroad;
3) To engage students with service-learning pre-departure and during their time abroad.



Description

With a total landmass of 2,300 square miles, Andros Island is the largest island in the Bahamas, but it is rural and largely underdeveloped with a total population of fewer than 8,000 counted in the last census (The Government of the Bahamas Department of Statistics, 2010). Access to healthcare is limited, with nine clinics and no hospitals on the island. Patients with serious health problems or injuries and pregnant women nearing their delivery date are flown to nearby New Providence to obtain medical attention.

Veterinary medicine is an even greater challenge, as there is currently no veterinarian on Andros despite a large population of indigenous dogs and other companion animals. These dogs are "loosely" owned, but a large number receive very little care. Furthermore, in 2014 an outbreak of distemper killed a large number of the dogs on Andros due to their limited access to vaccination. Each year, Columbus State University partners with animal rescue organization Potcakes of Andros to bring in a veterinarian to run a two-day spay/neuter clinic as a part of this course. Students are the primary labor for this clinic and work closely with the veterinarian to provide care for animals before, during, and following surgical procedures. Students observe surgeries and often develop research projects directly related to animal health, including quantifying internal and external parasites, testing for diseases like heartworms and ehrlichiosis, and characterizing how field surgery and anesthesia approaches differ from the U.S.

Structure

- Pre-departure
    - Students engage in class discussions that cover microbiology, infectious disease, immunology, and vaccines;
    - Students design small group research projects relevant to health and disease on Andros Island that involve collecting either quantitative or qualitative data before departure and while abroad;
    - Students gather needed supplies to donate to the medical clinics on Andros Island;
    - Students raise funds and gather donations for the spay/neuter clinic to be offered while abroad.
- While Abroad
    - Students participate in a two-day spay/neuter clinic for the people and companion animals of Andros Island;
    - Students conduct research on their pre-chosen topic as a small group and collaborate with other groups when appropriate and/or necessary;
    - Students visit medical clinics on Andros Island to observe healthcare, approaches to infectious diseases, and vaccination practices, and interview community members and medical staff.
- Post-trip
    - Students analyze data collected and present their findings in the form of an oral presentation and optional dissemination at a local conference.

Reflection

Over the three years that this course has run, students have raised over $3,000 to sponsor the spay/neuter clinic on Andros, collected over $25,000 worth of donated flea/tick preventative and canine vaccines, and collected medical donations for the clinics on Andros, including blood glucose meters and blood pressure monitors. Furthermore, this initiative has spayed/neutered and vaccinated over 80 animals on Andros Island, dramatically decreasing the number of stray dogs in the community and their susceptibility to disease. Due to the lack of access to veterinary care, these surgical procedures, opportunities for vaccination, and distribution of donated flea/tick prophylaxis are truly impactful in the lives of the people and animals that live there. Learning outcomes are assessed by examination and students demonstrate proficiency in the areas stated in mini-goal #1 as well as area D learning outcomes. Student research projects are completed

upon return, presented to their peers and professors, and often presented at our University's undergraduate research conference.

Student evaluations from this course have been consistently positive over the three years that I have offered it, with a mean of 5 (5 being highest) on all evaluation scores. Student comments also offer some insight into the perceived benefit and impact:

"*I loved almost everything about this course. From learning about Andros in class to actually on the island [sic], the entire experience was educational, enlightening, and made for an amazing semester. . .My favorite part of the trip besides the people was getting to participate in the spay and neuter clinic.*"

"The trip was a life-changing experience and I really wish I could go again!"

Conclusion

This course provides a unique opportunity to utilize several high-impact practices, including international education, service-learning, and undergraduate research. By involving students early in planning for the trip, they are given a sense of autonomy and ownership over their achievements in both service and research projects. When combined with the extraordinary experience of interacting with and providing a service to the international community, this makes for a life-changing experience that reaches far beyond the simple learning outcomes that we typically assess.

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Honing Communication and Organizational Skills through Community-based Engaged Learning

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Author Biography

Dr. Hasitha Mahabaduge is an Assistant Professor of Physics at Georgia College and State University. He was one of ten 2017-2018 USG SoTL Fellows, a 2019-2020 Governor's Teaching Fellow and received the Felton Jenkins, Jr. Hall of Fame Faculty Award for Excellence in Teaching in 2020. Dr. Mahabaduge was also named a Fellow of the International Society for the Scholarship of Teaching and Learning in 2020. Dr. Mahabaduge teaches both introductory and upper level physics courses. His research interests include fabrication and characterization of solar cells and Physics Education Research.

Introduction

High-impact practices have been shown to increase college students' chances of getting career-oriented jobs upon graduation. Service Learning or Community-based Engaged Learning (C-bEL) is considered one of the high-impact practices (Kuh, 2008). Learning experiences that meet the criteria of (i) students integrating theory and practice, (ii) having direct interactions in community settings, (iii) participating in mutually beneficial partnerships with community organizations and (iv) critically reflecting on their community-based learning activities are designated as C-bEL.

C-bEL projects were introduced to upper level physics courses where physics students were guided to write reflections on the lessons learned. Most physics undergraduates were unfamiliar with writing reflections. They perceived both C-bEL experiences as well as reflections as equally important as the course content to be successful in the workforce. One C-bEL activity offered for upperclassmen was to conduct workshops for elementary school students. Physics students who participated in the activity reflected on how Community-based Engaged Learning prepared them to be better communicators and collaborators.

Goal of Activity

The goal of the activity is to provide upperclassmen a capstone experience by engaging them in an opportunity to practice and hone their communication and organizational skills in a real-world setting. Physics students' feedback following the activity reflected the recognition by them of the value of essential skills. Another goal of this activity is to support elementary school curriculum with engaging and interactive workshops. Elementary school students who participate in the event also benefit immensely from these types of experiences as it helps to instill a passion for STEM fields in these students at a young age.

Description of the Activity

Undergraduate students are responsible for developing, coordinating and executing a workshop on renewable energy for local area elementary school students. The workshop is offered annually in the Fall semester and hosted at the University. The instructor of the course makes the initial connection with the local area elementary school teacher to determine the date. The elementary school teacher is responsible for the logistics for the elementary school students including transportation. Each undergraduate student is assigned a topic and a demonstration related to renewable energy. For example, for the topic solar energy, *ride on a retrofitted solar powered golf cart* and *making solar cells with berries* are the most popular demonstrations among the elementary school students.

Once the date is confirmed for the workshop, undergraduate students reserve the respective facilities and order necessary parts for the demonstrations. They are responsible for organizing the event and setting up

the agenda. Internal funding is available to cover the expenses. One key feature of this experience is physics students need to prepare presentations at two different levels: elementary school students' level and undergraduate level. Physics students do preliminary presentations and receive feedback from the instructor and peers. Their presentations are evaluated using Toastmasters International speech evaluation criteria (Toastmasters.org). This particular workshop started in 2016 as a one-hour workshop for twenty-five students and has grown since then. In 2019 this particular workshop was hosted as a "Renewable Energy Day", for five hours and seventy-five elementary school students participated in the event. More information including photos of this particular activity can be found in local area news outlets (O'Donnell, 2018; Vann, 2019).

Student Feedback

Once the workshop is completed, physics students were guided to reflect on the experience using prompts similar to the following.

- How did you apply ideas, theories or methods you've learned in class to addressing the identified social need? Provide examples to illustrate your explanation.
- How have your own attitudes changed as a result of this assignment or activity?

A study on the effect of C-bEL on student attitudes and behaviors was also conducted and the results were shared elsewhere (Mahabaduge, 2019). As part of the study, physics students completed pre- and post-surveys compiled by the office of ENGAGE at Georgia College (GC). C-bEL was GC's official Quality Enhancement Program (QEP) from 2014-2019 (Georgia College, 2019). Given below are selected comments from the post survey provided by the undergraduate students who participated in the activity.

> *…Another unique perspective I learned to value was that of a mother. One of the members of the prep team is a mother of two children while also a full-time physics student. Her tenacity for education shone through her efforts during the community engagement event. Her perspective helped optimize the event's schedule and layout to minimize interruptions, interferences and delays.*
>
> *People from different backgrounds look at problems differently and can solve them in a way that you may not have thought of. While working with kids, I noticed that people with younger siblings worked better with them than I did.*
>
> *As we introduced students to new topics related to renewable energy, listening to their interpretations helped me value their young minds as highly creative and absorbent. This event helped me revalue the intuition, creativity and intelligence of young children.*
>
> *Many skills needed for this project were leadership skills and collaboration. Core classes need to focus on increasing these skills so people can survive in the real world.*

Conclusion

As the undergraduate students' feedback suggests, conducting the workshop for elementary school students helped them to understand the importance of soft skills. Introducing a peer evaluation system based on Toastmasters International added more excitement and participation from students, as it was fun and exciting to note any overused words or filler sounds used as a crutch by the presenter**.** Inappropriate interjections such as *and, well, but, so* and *you know* as well as sounds *ah, um* or *er* were noted for each presenter and a significant decrease in the use of these filler words observed during the second iteration of the presentations.

This activity equally benefits the elementary school students. As shared by one of the elementary school teachers, "Both the big kids and the little ones benefit from this experience, my students are always so excited to be able to learn from college students. Some of them have never actually been on campus before, and

their reactions are priceless—full of wonder and awe" (O'Donnell, 2018). Considering the feedback from both undergraduate students who organized the activity and elementary school students and their teachers who participated, it can be concluded that this particular community-based engaged learning activity is a win-win situation for everyone.

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Collaborative Testing: Increasing Rigor, Combating Anxiety, & Facilitating Prompt Feedback

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Author Biography

Marina Smitherman is Department Chair of Life Sciences and Professor of Biology at Dalton State College. With two decades of college teaching experience, Dr. Smitherman has specialized in Educational and Organizational Development; serving as Director of the Center for Academic Excellence leading faculty development in Teaching and Learning, leading High Impact Practice curriculum innovations, chairing the Georgia Consortium of Teaching and Learning Directors. She received the University System of Georgia Felton Jenkins Jr. Faculty Hall of Fame Teaching Excellence Award in 2020. She co-authored "Taking Flight: Making your Teaching and Learning Center Soar" published with Stylus in 2020.

Background

Teaching is a collaborative endeavor (Cook-Sather, 2020). As faculty we can set rigorous academic expectations but students have to rise to meet them. For many students, including our first-generation or fixed mindset groups, support and encouragement may need to come from within a course from peers or an instructor. Students may lack the belief that they can succeed due to negative past testing experiences or from a lack of family support and understanding (Markman, Balik, Braunstein-Bercovitz, & Ehrenfeld, 2010). If students feel pressured to perform in a course critical to their career progression, testing can feel high-stakes leading to significant anxiety and lessen performance or achievement (Hoachlander, 1998; Markman, Balik, Braunstein-Bercovitz, & Ehrenfeld, 2010).

Figure 11: Students take a collaborative test in Anatomy and Physiology lab.

Collaborative testing is a natural extension of collaborative learning: a high-impact, student-centered, active learning approach (Johnson, Johnson, & Holubec, 2008). Engaging students collaboratively during testing allows for raised expectations whilst giving them the opportunity to work with peer support and feedback. This has been shown to lower the incidence of test anxiety (Leight, Saunders, Calkins, & Withers, 2012). Students also perceive that they learn better collaboratively and can feel positively interdependent and accountable to their peer group, leading to additional benefits including higher individual testing scores and development of transferable team-working skills (Leight, Saunders, Calkins, & Withers, 2012). Collaborative testing also increases student understanding of content as peer-to-peer instruction provides prompt feedback on performance, corrects misconceptions, and maximizes opportunities for critical reflection on learning (Johnson, Johnson, & Holubec, 2008; Johnson, Johnson, & Holubec, 2008). If summative assessment determines whether learners have acquired knowledge, mastered concepts, and achieved objectives and formative assessment helps them reflect on whether the learning objectives were met, why not employ both at once?

Activity Description

From our first day students work collaboratively on assignments designed to help them achieve the learning objectives and achieve on stratified assessments. Working groups are established the first week, which includes a regular partner and group of two pairs with four students. This has been shown to significantly improve student achievement compared with individual testing (Haberyan & Barnett, 2010; Barnett & Haberyan, 2006). It seems preferable to use established groups consistently so that students get used to their group dynamic and build friendships (Cook-Sather, 2020). They have the freedom to choose their own groups which increases their level of comfort as they progress through the semester.

The first time students experience assessment on any new topic is a low-stakes challenge in their groups of four to give them retrieval practice to identify any knowledge gaps before it counts considerably towards their grades. Later, having had time to revise the material and study in their groups, they take a more rigorous medium-stakes test in pairs. Finally, they take their higher-stakes quarterly exams individually in 80% of the time for 80% of the grade, followed by a retake of the test in groups of four in 20% of the time for 20% of their grade. This includes their cumulative final course assessment. Because each student takes a differing amount of time to complete their individual portion of the test, this presents an opportunity for a mindfulness break for those that complete quickly. Students are encouraged to bring paper to doodle/color on, a novel to read, to take time to meditate, play with a stress ball, etc. Those that forget often doodle on the test, which makes grading more fun! We also usually bring in food to share and make it a true celebration of learning.

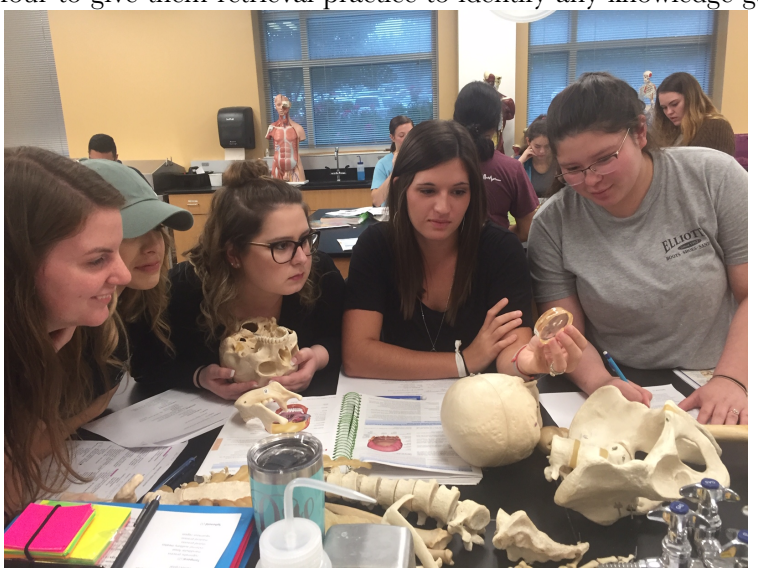

Figure 12: Students work together in skeleton lab.

Prior to using collaborative testing, exams employed multiple choice questions to test different levels of Bloom's taxonomy. Collaborative exams however make it possible to increase the rigor by incorporating a variety of tasks that would be too challenging for any individual student to complete in the allotted time but are easily feasible for a group. This includes problem-based or case-study questions, writing-intensive questions, and/or creation of something to demonstrate key concepts like concept-maps or flow-charts.

The students are encouraged to debate each answer fully, however the collaborative group grade can increase but not decrease their grade. If an individual student knew the correct answer but could not get the group to agree, they are all more likely to remember this in the future. The collaborative portion enables them to fill gaps in their knowledge, get prompt feedback on their individual performance, and have fun building team-working skills in the process. As an instructor walking around the room while they take the collaborative section, it is enlightening to absorb and support their debates and discussions about why specific answers would be correct or incorrect utilizing and demonstrating critical-thinking skills.

Reflections

This technique ensures students are good-natured about challenging tests because if they miss a question individually they still have the opportunity to get it right with their peers. Some faculty will argue that this does not enable them to fully test individual students. However, this ignores the aim that students need to

master the subject by the end of the course and not necessarily as they go along. Students are also more likely to reflect on how they did individually whilst getting prompt feedback on the answers as they go back through the test a second time. Students usually analyze their performance individually following a test so it is preferable that instead of giving themselves a hard time for missing a question, they can get points back by getting it right on the group-attempt and these lessons appear to stick. Students leave this section knowing what the right and wrong answers were on the test without me having to cut their exam time short to go through it promptly, or take up class time in the following session to do that. They also often reflect on the reason other students may have been more successful and what they need to change to improve their performance on the next test.

Across the board students love the collaborative learning and testing; "*I loved it*" being the most common on student feedback at the end of the semester. Student comments on our collaborative tests include the following:

> *I really enjoyed this. Being able to retake and talk about the test right afterwards made me feel a lot better about my own answers and less alone when I was having difficulty at times.*
>
> *I really enjoyed the collaborative tests a lot. It was great to get feedback from other students and correct mistakes as we went along.*
>
> *It is very helpful and gives you the opportunity to see what you missed, and for other classmates to explain why the answer is right or wrong.*
>
> *This made me realize that I wasn't alone in the struggle and stress of learning.*

Conclusion

Collaborative testing facilitates increased rigor and provides prompt feedback whilst cutting anxiety for the students, and assists them in building transferable skills. If effective teaching and learning is collaborative, and a successful workplace is collaborative, then assessment in higher education should be collaborative.

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Adaptive Learning Strategies for Introductory Classes

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Author Biography

Chris Brown is a senior lecturer in GSU's Political Science Department, a founding officer of the World Affairs Council of Atlanta, and the creator/director of the Robinson Country Intelligence Index, a unique teaching and research tool developed at Georgia State. Since 2016 he has been part of a project, funded by the Gates Foundation, seeking to bring adaptive learning to GSU classrooms. Brown also leads a study abroad course to Ireland. From 1994 until 2009, he was research director at the Southern Center for International Studies. He received his M.A. and Ph.D. from UGA and his B.A. from Sewanee.

Adaptive learning (AL) courseware holds promise for helping break down barriers students face as they steer their way through college. It is broadly meant to adjust to students' abilities; offer personalized feedback; allow students to self-pace through course modules, build competency, and seek mastery; give students agency over their grade; and prepare students for face-to-face (F2F) class time and higher-level learning strategies. My colleagues and I at Georgia State have long worked to address the challenges of a high-volume introductory class, Global Issues (GI), and viewed AL courseware as another possible tool in the toolshed.

GSU's GI course has many large, 120-student sections, over 2,700 students annually, and 10-14 rotating instructors per semester (including many GTAs; see Table 1). While sophomores are the largest cohort, there are also significant numbers of freshmen, juniors, and seniors. We have repeatedly found that while many of these students perform well, others do not complete class assignments even if quizzed on it, and sometimes they do not even purchase the book. A handful of students rarely if ever comes to class. Students taking GI classes generally have significantly divergent levels of prior knowledge and overall preparedness for college. The result of such challenges has been that a persistent proportion of students come poorly prepared for class, classes have lower-than-desired student performance, satisfaction, and engagement, students do not have enough agency over their own time and grades, and professors are less able to use higher level learning activities.

Table 5: Global Issues Totals Fall 2017-Spring 2019

No. Online Classes	No. F2F Classes	No. of Students Online	No. of Students F2F	No. of Classes Taught by Faculty	No. of Classes Taught by GTAs	Average No. of Students per Class	No. of Classes with ≥ 100 Students
10	41	1756	3458	28	23	97.68	28

In 2016, GSU received a grant from the Gates Foundation to embed adaptive learning in large, introductory classes. Given the promise of AL and the challenges of Global Issues classes, in 2016-2017 we developed an AL GI course, and then implemented it across 51 classes and more than 5,200 students during the 2017-2018 and 2018-2019 academic years. In spring 2018, we also initiated a four-group study (adaptive versus non-adaptive in F2F and online). Based on previous research in the field (see, for example, Bailey, et. al., 2018), our study included four control variables (Pell Grant eligibility, high school performance, first generation students, and first-year students).

A course using AL courseware has a "black box" of triggers and impacts (see the promises noted above), and our course was certainly unique to our own creative work, academic landscape, and the adaptive

platform we used (Realizeit). Our AL sections used the full functionality and content—primarily an online text, open educational resources, and a dynamic data literacy tool—of the course we built. This foundation allowed students to self-pace through granular, adaptive, mastery and agency focused pathways and lessons. Instructors used the courseware's analytics to find where there were holes in student understanding which needed to be addressed in the classroom. The non-AL students were taught in a more traditional way, with students being assigned an online text chapter and other materials to cover each week, and online quizzes assessing formative knowledge. Of course each instructor, whether online or face-to-face, used the either adaptive or traditional course delivery method as a base, and then added their own pedagogic strategies and skills to achieve the common course learning outcome goals and push their classes to higher level learning.

Anecdotally, instructors in AL sections reported better overall class preparedness and engagement, as well as being able to move to higher level learning strategies, applying course concepts. Professors could quickly check for student knowledge of the basics (what are the main UN organs? what are the different "generations" of human rights?) and then engage more readily in active/cooperative learning and other approaches. Note, three instructors taught both an adaptive and non-adaptive section.

Our quasi-experiment yielded more evidence of AL's positive impact. In each semester during the two academic years, except spring 2018 when half the sections used non-AL courseware, all sections of the course were taught using the AL courseware. Across these AL sections and on every question in a survey of student perceptions, students gave highly positive ratings of the AL courseware (see Figure 1).

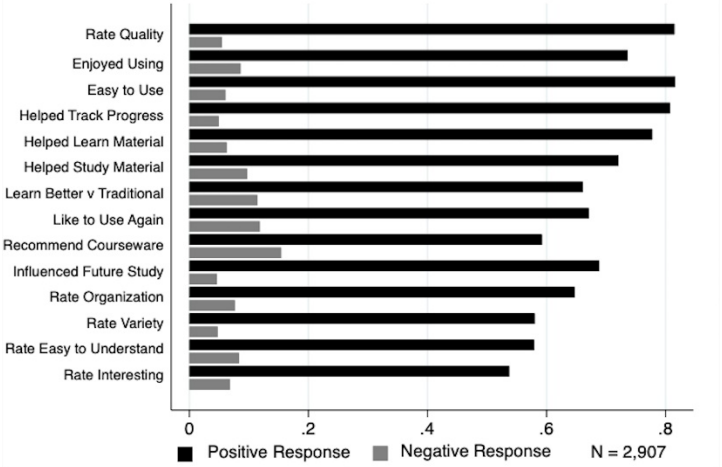

Figure 13: Aggregate Survey Question Responses (Four Semesters)

In the spring 2018 assessment of the AL courseware as compared to a non-AL course, the perceptive differences between the adaptive and non-adaptive sections were statistically significant on every question except "Rate Organization" and "Rate Easy to Understand." However, our hypothesis that students would have similarly significant positive perceptions in both F2F and online classes was not supported. While both cohorts had positive perceptions of the courseware, only among the F2F students was the difference between the AL and non-AL sections statistically significant. This result goes against the research findings of others (Yarnell, et. al., 2016) and provides impetus for future investigation.

We also looked at the performance differences between adaptive and non-adaptive cohorts using common test questions administered throughout the spring 2018 semester. For F2F students, the performance improvement between AL and non-AL classes was statistically significant, while in online sections the students in the AL section scored higher, but the difference did not reach significance. Across all sections,

the performance difference between AL and non-AL classes was statistically significant and substantively translated to students in AL sections scoring roughly two points higher across the common questions.

When controlling for student characteristics that we anticipated may drive perceptive and/or performance results, we found that only first-year status informed the results in any way. Performance improvement with respect to using the AL courseware was found primarily among freshmen as opposed to upperclassmen. However, first-year status did not inform the positive student perceptions.

It is also important to note that the average DFW rate in spring and fall semesters fell as the AL courseware was introduced. The mean DFW rate from 2013-2019 in non-AL courses was approximately 16%, while in AL courses it was 12% (see Figure 2). This difference is statistically significant. Furthermore, in the spring of 2018, in which both adaptive and non-adaptive courses were offered, the DFW rate in adaptive courses was 9 percentage points lower than in traditional courses (21% vs. 12%).

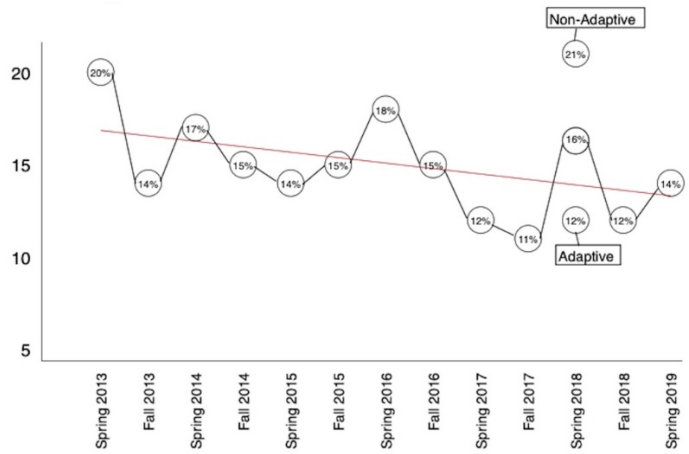

Figure 14: Global Issues DFW Rates 2013-2019

Overall, our promising findings support the case that AL courseware can provide a useful foundation for student progression, success, satisfaction, academic confidence, and performance. Surveys of student perceptions show strong evidence of the broad ability of the adaptive course to improve student engagement and enjoyment. Student performance improvements vis-à-vis traditional courses point to possible better student class preparedness and the use of higher-level learning strategies in the classroom. A decline in DFW rates indicates that gains in student learning and confidence may lead to quicker progression through college.

Author's note

The study that serves as the basis for this essay represents a significant effort by a team of people, including my co-authors on a forthcoming paper: Jeannie Grussendorf, Michael Shea, and Clark DeMas. Also, Jeannie Grussendorf and I, two of the eight faculty listed on GSU's Gates grant, have received compensation for our creative efforts on this project.

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Digital Storytelling as a Method of Reflection in the First Year Experience Course

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Barbara G. Tucker is Professor of Communication and Chair of the Department of Communication, Performing Arts, and Foreign Languages at Dalton State College. She has spent 42 years in higher education teaching and administration. She holds master's degrees from Ohio University and the University of Tennessee Chattanooga, and earned the Ed.D. in Organizational Leadership from University of Georgia. She has extensive practical and research experience in faculty development, open educational resources, communication education, online teaching, and SoTL. Dr. Tucker is a published author of seven novels and speaks frequently on creative writing. She and her husband live in Ringgold, Georgia.

Literature on High Impact Practices lists First Year Experience as one of eleven practices that lead to greater student engagement and completion (Kuh, 2008). In the past few years, I have taught such a course as a theme-based, one-hour section that combines exploration of an important question with application of academic skills such as information literacy and goal setting.

My particular course, Perspectives in Liberal Arts, explores the place of liberal arts in higher education and the students' futures. The four learning outcomes of the course, set institutionally, focus on factors related to critical thinking, perspective taking, support of one's own perspective, and issue identification. Specifically related to this essay, students are to 1) demonstrate an enhanced ability to critically evaluate information and its sources, and 2) demonstrate an enhanced ability to support his/her perspectives related to an issue or problem.

Kuh and O'Donnell (2013) explained that an activity labeled "High Impact" does not achieve that standard unless it meets most or all of eight "quality matrices." The fifth is "Faculty provide for and prompt students to engage in periodic, structured opportunities to reflect on and integrate their learning." Reflective practice figures prominently in guaranteeing the high-impact nature of experiential learning. However, offering students opportunities to reflect does not ensure that students will understand, engage in, and produce evidence of reflection at a deep level. The reflection can seem like an obligatory writing exercise proving to the instructor that the student "got something" out of the experience. Additionally, first year students may be unprepared for the kind of reflection that achieves integration of learning, especially in written form. Reflection is a learned process for which students must be trained.

Reflection has at least two distinct parts: the *process* of reflection, which may involve journaling, group discussion, self-talk, or even visual art; and the *product* of reflection. Yancey delineated three stages: reflection-in-action; the identity-formation processes that accumulate over time; and reflection-in-presentation, a formal text written for "the other" (Fiscus, 2017). Here I argue for a non-traditional, non-written reflection product: digital storytelling.

Digital Storytelling

Our students have spent most of their lives in the digital age and take for granted the ready accessibility of audio, visual, and interactive digital media. The term "digital storytelling" appeared in the 1990s. It is defined on the University of Houston's website (2020) as "the practice of using computer-based tools to tell stories." Ruppert, Adcock, and Crave (2017) citing Skouge and Rao (2009) stated, "One of the strengths of using digital storytelling…is that it employs a wide variety of strategies including standard storytelling,

multimedia publication, audio and video recordings, image production, and shared mediated events" (p. 33). The literature on digital storytelling typically focuses on its use in K-12, preparing pre-service teachers, and ESOL instruction.

In my case, I use the digital storytelling assignment as the final reflective product of the course in order to meet the outcomes of 1) demonstrating enhanced abilities to critically evaluate information and its sources and 2) support their perspectives related to an issue or problem. By expressing themselves through digital storytelling, a kind of text distinct from standard writing assignments, the students choose visual and musical materials, recognize the correct use of Creative Commons and fair use materials, and utilize digital materials that answer one of these topics related to the college learning skills:

- What do my five "strengths" (from Strengthsquest) mean to me?
- Who am I?
- What would I do if I weren't afraid?
- My obituary
- My first semester of college

They are informed their digital story will be assessed on these characteristics:

- Answering their chosen question, visually and through plot.
- Length at least three minutes long.
- Use of animation/movement.
- Incorporation of sound (music/voiceover, preferably both).
- "Credits" shown at the end.

I use a more detailed rubric for assessment. Students may use their choice of digital tool. Many use PowerPoint because of its familiarity, and it can create an excellent digital story; however, this project creates a self-contained program that runs without student help. Other students create edited videos on their computers or use online animation tools that offer "freemium versions," such as Powtoon, RenderForest, or Animaker.

I frame their showing of their projects as a festival competition. We watch the stories together, and each storyteller orally explains the creation of the digital story—another way of showing evidence of reflection. Fiscus (2017) recommends the use of a written text to accompany multi-modal projects such as digital storytelling, an addition I plan to make to the assignment. After the viewing, the students vote for a winner, who receives a restaurant gift card.

Student Responses

I provide here two comments from students:

> *I absolutely loved the digital storytelling project. It was a great way…to share a story through our creative talents that related back to our course material…. The support we all had for each other and their project was amazing, I actually made some new friends after I finished my presentation. It was a truly unforgettable project!*

> *The idea of the project was definitely not something I looked forward to during the semester. However, when it actually came time to put it all together, I really had a good time with it. It was not only fun to give a glimpse into my life to the class, but was also nice to reflect on myself and take time to create a project based solely on me. I especially loved the aspect of not having to stand in front of the class to present it. I would say it is a good assignment to keep in your future classes.*

Conclusion

I find digital storytelling a productive way for students to use visual rhetoric; understand source citation, fair use, and copyright; organize the images and sound thematically and creatively; meet the course outcomes; and reflect on the personally relevance of the course. The project also engages the students in a different modality of reflection and creation.

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Low to No Cost Undergraduate Research: Mentoring Biology Students When Resources are Scarce

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Author Biography

Dr. Amanda L. J. Duffus is an Associate Professor of Biology and a Center for Excellence in Teaching and Learning Faculty Fellow at Gordon State College. She is actively involved in undergraduate research and mentors students not only by herself, but in conjunction with other faculty. Over the past 10 years, she has mentored over 40 students who have presented at regional, national, and international conferences and has published six peer reviewed journal articles with student authors. She is happily married with a son, owned by four cats, and is a budding karate student.

Undergraduate research (UR) is one of the Association of American Colleges and Universities high-impact practices (Kuh, 2008). These experiences take a variety of forms, including course-based undergraduate research experiences (C.U.R.E.s), and mentoring of individuals or small groups where the student takes charge of a project or small areas of a larger project. Unfortunately, there are limited funds available for undergraduate research at most teaching-intensive colleges, where obtaining external funding has been an issue. This situation will only get worse as declines in enrollment and state budgets further reduce funding to our institutions of higher education. As educators, we always aim to do our best for our students to prepare them for their post-degree lives, which is rendered more difficult under financial strain.

Goals of Activity

Our students face many road blocks in successfully completing their undergraduate studies. Providing authentic research experiences to undergraduates can be a way to engage students in their education and to expose them to different potential career paths. The mentorship that students receive from faculty can be extremely influential in their success as undergraduates and beyond. My goal is to help undergraduate researchers develop transferable skills (critical thinking, problem solving, academic writing, presentation skills, etc.) that will help them be successful in different career paths, such as graduate or professional school, industry, and so on. These practices and values fall in line with those presented by Reed (2018), have led to many successful student-faculty collaborations, and have produced a multitude of student-led presentations.

Description of Activity

In addition to my teaching duties, which do not include student-oriented research, I work with students in small group settings (lab meetings) and individually, where the students are responsible for a project or a small portion of a larger study. I require students to present their work to the lab group so that they can have a safe place to develop presentation skills and get feedback from the rest of the group and me. The undergraduate researchers with whom I work are required to write literature reviews to master the material and to explore the literature to see if there are other directions that they might want to go in their work. I give extensive feedback on the literature reviews, especially the early drafts, which the students must submit about a month before the final draft is due. I spend a lot of time with each student individually, which really adds value to the experience as I guide them through their educational journey and hopefully get them where they want to be at the end of their undergraduate career.

Getting students to professional conferences presents another funding obstacle. Many regional conferences are relatively low cost for students and also have travel awards that students may apply for. A great example of this is the Georgia Academy of Sciences (GAS, http://www.gaacademy.org/). The fee for student registration is typically about $60, and there is a travel award that students may apply for. Despite these low

costs, many students still cannot afford to attend. In order to overcome the costs associated with professional conferences, one great way to promote UR is to have a research day or a STEM poster hour on campus. These research events can be formal or informal. At Gordon State College (GSC), we have an annual Undergraduate Research Symposium (URS) for our students. It is organized by a committee and is a day-long event that encompasses student research in all disciplines. The URS at GSC was started in 2011 and has been successful enough to be developed into a full-day event. There are both oral and poster presentations and these presentations are judged by faculty members, with the best presentations receiving awards.

Publishing with UR students can be especially problematic when no funding is available. Many scientific journals charge exorbitant publication fees, and relatively few have programs available to reduce the costs associated with publishing by students. Therefore, college level faculty development grants can be a great resource for paying for page fees. While we would like to think that publishing is not essential, it really does have the potential to help students further their academic careers, and it gives them an edge when applying for jobs.

One other major issue that can affect student interest and success is the subject matter and the area of expertise of the faculty mentor. In Biology and many other STEM disciplines, it is very rare that UR can be undertaken with few or no costs associated with the actual research itself. Some areas of biology lend themselves better to low/no cost research than others, and I was lucky to be able to use my background in evolution/genetics (undergraduate focus) to shift my research from viral ecology (which was the focus of my graduate degrees) to viral genetics and evolution. I also work with ranaviruses, which are globally emerging infections in amphibians, fish, and reptiles, so there is a lot of sequence data available and many unanswered questions that this data can address. More generally, in many areas of biology there are large publicly available data sets that might be used as a basis for research on questions related to a faculty member's interest. For example, see the database *Dryad*. There are also many different freely available bioinformatics and statistics programs that can be used, even by less skilled students, who can quickly develop mastery with a little guidance. I realize that some researchers refer to them as black boxes, but they are nevertheless used for both presentations and publications.

Reflection

Over the past 9.5 years, I have mentored over 40 individual students who have presented at conferences. Importantly, many of these students have pursued multiple projects with me. All in all, my student mentoring has led to over 60 student poster presentations at the GSC URS, regional, national, and international conferences/meetings; six student oral presentations at regional meetings; three student-led peer-reviewed publications; and three student-involved peer-reviewed publications. Many of these students have gone on to professional and graduate programs, and some have gone directly into the workforce. I know that their research experiences gave them the ability to make informed decisions concerning their careers. Low to no cost UR in STEM is extremely challenging, but very rewarding. Building meaningful collaborations with students and helping them develop their skills is something that we all should aspire to, whether in the classroom, small groups, or individually. While I understand that this is not possible for many faculty members at teaching institutions because of time constraints and access to research facilities, it is something to consider if you can. It has truly been the most rewarding part of my career so far.

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Experiential Learning Activities in an IT Course

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ChongWoo Park is an Associate Professor of Management Information Systems in the Hull College of Business at Augusta University. His research work has been published in quality journals including Decision Sciences, Journal of the Association for Information Systems, IEEE Transactions on Engineering Management, Journal of Computer Information Systems, Computers in Human Behaviors, and Decision Sciences Journal of Innovative Education. He has received Augusta University Scholarship of Teaching and Learning Award (2019), Hull College Faculty Research Award for Excellence (2019), AU Education Innovation Award (2018), AU Scholarly Activity Award (2016-2017, 2017-2018), and IACIS Best Research Paper Award (2013).

Augusta University has initiated experiential learning programs to implement the quality enhancement plan (QEP) – Learning by Doing – since 2015. As part of the QEP, the education innovation fund was established to support teaching faculty who wish to pursue experiential learning opportunities in the classroom. When I was assigned to teach a database management systems (DBMS) course for Information Technology (IT) and Management Information Systems (MIS) majors, I was looking for how to bring the most up-to-date IT and database experiences into the classroom. Augusta University's education innovation fund gave my students experiential learning opportunities to have hands-on experience in cloud computing technology and the enterprise DBMS used in the IT industry and large businesses.

Goal of Activities

While educators have had broad discussions on experiential learning activities and applications such as study abroad, service-learning, project-based learning, and internships (Kuh, 2008), there has been less discussion on specific experiential learning activities that can be plugged into the curriculum of an IT course of interest (e.g., experiential learning activities in a database course or a programming course). Thus, I had to develop such activities from scratch when planning to implement experiential learning in my DBMS course. The goal of the experiential learning activities I developed was to allow students to have experiential learning in the IT course and to understand the impact of experiential learning on student learning outcomes in the IT curriculum.

Description of Activities

I first defined the five areas of experiential learning in the IT course—communication, leadership, professionalism, problem solving, and teamwork—based on Augusta University's QEP (Augusta University, 2016). In order to implement the five areas of experiential learning, I developed two major experiential learning activities in the database management systems course. One was the group project of database design and development based on real-world business problems. The other was access to enterprise database systems such as MS SQL Server through the cloud computing environment. By engaging in these two experiential learning activities, students were expected to have experiential learning in the five areas.

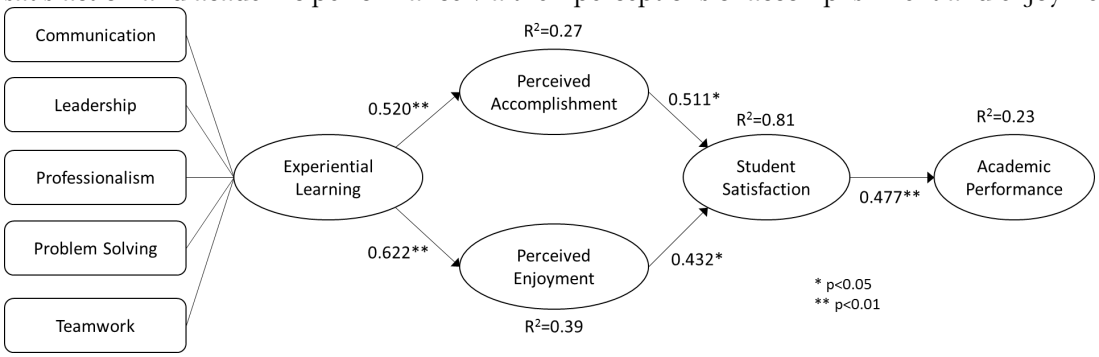
For the communication, teamwork, and leadership areas, students were asked to 1) form a team of three or four for the group project, 2) review real-world business problems with different data management cases of a bookstore, consulting firm, and dining club as a team, and 3) come up with and choose one as their group project case. In order to form teams, students were first categorized by the instructor into one of three groups based on previously demonstrated strengths in different skill sets. The students were unaware of the criteria that had them assigned to each group. Students then formed teams by including at least one member from each different group in order to balance the skills of each team.

While conducting this group project, each member in each team had an opportunity to take a leadership role for at least one part of the project (e.g., functional dependency diagram, entity relationship diagram, data dictionary, SQL, business questions, progress report, final report, and oral presentation), and each team was also required to submit progress reports for each part of the project.

The problem-solving area included working on and providing the database solution for each business case as a team. Funded by the education innovation award, students in this course had free access to Microsoft Azure, a leading cloud computing service, including MS SQL Server and other database tools. This access to the enterprise database systems in the cloud computing service brought a professional experience to this class (i.e., experiential learning in the professionalism area). It also contributed to the problem-solving and teamwork experiences because students were required to implement their database solutions in MS SQL Server in cloud for their individual assignments and group project.

Reflection and Student Feedback

Upon completion of the activities, I conducted a survey to examine the effects of experiential learning in this course with the following theoretical model. The results show that the five areas of experiential learning contributed to the students' overall experiential learning, which leads to accomplishment, enjoyment, satisfaction, and ultimately academic performance in the IT course. All paths in the model are statistically significant either at the levels of $p<0.05$ or $p<0.01$ for two-tailed tests, showing that experiential learning contributes to students' perceptions of accomplishment and enjoyment in the course, which ultimately leads to their satisfaction and academic performance. In addition, the explanatory powers of the model with the R^2 values show that experiential learning accounts for 27% and 39% of the variance in perceived accomplishment and enjoyment, both of which explains 81% and 23% of the variance in student satisfaction and academic performance, respectively. Thus, these R^2 values are sufficiently high to make interpretation of all paths meaningful, indicating that experiential learning has a reasonable power to explain students' satisfaction and academic performance via their perceptions of accomplishment and enjoyment.



In addition, 88% of students reported that they were satisfied with their learning experience in this class and 92% of students believed that they had professional IT experience in this class. The student feedback below indicates that students appreciated the five components of experiential learning implemented in this course, especially highlighting the professionalism and problem-solving components by doing the teamwork and using the cutting-edge technologies as a valuable learning experience. The overall survey results provide me with the grounds to continue to develop and implement experiential learning in the IT courses for students' better learning experience.

Below are representative excerpts from student feedback on "What are the most valuable learning experiences in this course?" at the end of the semester:

- *Learning to collaborate!*

- *I appreciate how Dr. Park was able to help us understand how to effectively utilize MS Access and MS SQL Server in real world applications. This course definitely taught some new skills that I can use for both personal and professional use.*
- *SQL knowledge, SQL server was nice to use instead of strictly access since access is not widely used by larger businesses*
- *Working in SQL Server and seeing how the code is applied. Being able to see work is a huge help -- many classes tend to just throw out information but applying the content is difficult. I don't think that's how it should be. When we go into the workforce, we learn skills that are almost separate from that which we learn.*
- *I think the team project was the most valuable, because it combined everything we learned in class and made you use all the skills you had learned throughout the semester. Also, it gave you the experience of working in a group which is always important.*
- *Everyone has their own level of expertise. I enjoyed working through the VM with the SQL server. The hands work helped me understand the material, versus sitting and reading through the powerpoints.*
- *The final project, giving us the opportunity to develop and build a database based on a simple prompt, was the most valuable learning experience and a great way to practically apply what we learned throughout the semester.*

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Online Pedagogy: Lessons Learned from Teaching an Online Course in Georgia Tech's OMSCS Program

Ashok K. Goel
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Author Biography

Ashok Goel is a Professor in the School of Interactive Computing at Georgia Institute of Technology and the Chief Scientist with Georgia Tech's Center for 21st Century Universities. In 2014, he co-developed an online course on Knowledge-Based AI; in 2016, his research laboratory developed Jill Watson, a virtual teaching assistant for answering questions in online classes; and in 2019, he co-edited a volume on *Blended Learning* published by MIT Press. Ashok received Georgia Tech's Class of 1934 Outstanding Innovative Use of Educational Technology Award in 2017; and Association for Advancement of Artificial Intelligence's Outstanding AI Educator Award in 2019.

Introduction

The spread of COVID-19 has led to an unprecedented move towards online education across the country and around the world. This raises fundamental questions for online pedagogy: How do we develop a successful online course? How do we prepare high quality educational materials for online classes?

In 2014, my colleague David Joyner and I faced these questions when we developed an online course on Knowledge-Based Artificial Intelligence (KBAI) as part of Georgia Tech's Online Master of Science in Computer Science program (OMSCS; http://www.omscs.gatech.edu/). We identified about 150 KBAI concepts, methods and skills we wanted students to learn, developed a set of twenty-six video lessons, and designed a suite of homework assignments, design and programming projects, and take-home examinations (Goel & Joyner 2016, 2017). In Fall 2014, we offered the online class to about 200 students in the OMSCS program. In Fall 2015, I transformed the pedagogy I had been using in the in-person KBAI class for graduate and undergraduate residential students for more than a decade into blended learning (Goel, 2019). In Spring 2016, my Design & Intelligence research laboratory developed a virtual teaching assistant called Jill Watson for automatically answering routine questions in the online class (Goel & Polepeddi, 2017). We estimate that more than 6,000 students have taken the online and blended versions of the KBAI class since Fall 2014 and more than 150 (human) teaching assistants have helped with the teaching and learning in the class.

Assessing the quality of learning in any class is a complex matter, whether the class is online, blended, or in-person. Three types of data indicate that the quality of learning in the online KBAI class is comparable to that in the in-person class for residential students (Goel & Joyner, 2016, 2017; Goel, 2019). First, surveys of online students from Fall 2014 through Fall 2019 report the same kind and degree of satisfaction with the online KBAI class as do the residential students with the in-person KBAI class. Second, the completion ratio in the online KBAI classes during this period has been comparable to that in the in-person KBAI classes. Third, the performance of the online KBAI students on the same set of learning assessments has been comparable to that of the residential students in the in-person KBAI classes. In Fall 2018 and Fall 2019, we repeated the quasi-experimental studies in online and in-person sections of the KBAI class offered only to residential students, and found similar results.

Design Principles for Online Classes

In Goel & Joyner (2016), we analyzed the design principles for developing online classes in detail. Table 1 summarizes the 10 design principles underlying the online and blended KBAI classes. For example, the first principle suggests that the course instructor should explicitly establish the learning goals, outcomes,

strategies and assessments before developing the online class. The eighth principle indicates that design of an online class is an iterative process, with each iteration based on feedback and reflection on the preceding iteration. Thus, it is important to collect and analyze feedback and leave time for deliberation and reflection.

Table 6: Design Principles for Online Classes (adapted from Goel & Joyner, 2016)

1. Establish learning goals, outcomes, strategies, and assessments first
2. Allocate adequate time for design, development, and delivery
3. Deliberately recreate natural features of the residential class
4. Leverage the advantages of digital media for online learning
5. Design project-based learning carefully
6. Understand the audience
7. Break the isolation experienced by many online students
8. Solicit feedback and be ready to iterate
9. Leverage peer feedback and autograding wisely
10. Use the online class to enhance the residential class

Design Principles for Video Lessons

The twenty-six video lessons for the online and blended versions of the KBAI class embed about 150 exercises, one for each concept in the concept inventory, as well as about 100 tutors that provided adaptive feedback on many of the exercises (https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409). My colleague Chaohua Ou has analyzed the design of the videos and student responses to them over several semesters (Ou, Joyner & Goel, 2019). Table 2 summarizes the seven principles for designing video lessons for online classes derived from the analysis. For example, the seventh principle suggests the use of prepared visuals rather than drawing them at the time they are being presented to the class.

Table 7: Design Principles for Video Lessons (adapted from Ou, Joyner & Goel, 2019)

1. Learning by example
2. Learning by doing
3. Adaptive feedback
4. Learning through reflection
5. Four-phase instruction principle (activation, demonstration, application, integration)
6. Personalization principle (visible instructors, conversational presence, on-screen coaches)
7. Multimedia principle (prepared visuals)

Reflections

We note three qualifications. First, developing a successful online class requires expertise not only in the subject of the course, but also in information technology and learning science. It also requires a strong team, and significant financial and technological support. We were fortunate to have all these assets available when developing the online KBAI class in 2014. For example, Georgia Tech provided financial and technological support for developing the video lessons for the online KBAI class.

Second, if a teacher's goal is simply to convert the educational materials prepared for an in-person class to an online forum due to the spread of COVID-19 and the consequent need for social distancing, then we expect the design principles in Table 1 and Table 2 should be of some value. These principles are likely to add more value if in the longer term a teacher wants to develop a new online course from the start.

Third, learning in general is situated in the external world and thus is context dependent. Hence, the effectiveness and efficiency of learning depends not only on the individual learner, teacher, pedagogy, and educational materials, but also on the physical, technological, social and cultural contexts of learning. While we found the design principles enumerated above useful in developing the online KBAI class, we expect that their operationalization will vary across different learning contexts.

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Recognizing and Appreciating Science as an Integrated Part of Daily Life: A Case Study of Engaged Student Learning

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Author Biography

Paramasivam Sivapatham Ph.D., is a Professor of Environmental Science at Savannah State University, teaching and conducting research for over two decades. His focus is on environmental health research (soil, plant, water, air and waste management). His scholarly accomplishments include: 15 book chapters, 75 peer reviewed papers, 75 conference paper presentations and 12 invited presentations. He has served as a Co-PI, CORE Leader, and Collaborating faculty in NIH and NSF funded grant programs. He is also Co-PI of one of the NSF Grants (PRISM) availing funds for developing Discovery Learning Laboratory at Savannah State University to teach Science to non-science majors.

Introduction

As one who teaches Integrated Science to non-science majors, I use the very simple definition of science, namely, "the state of knowing: knowledge as distinguished from ignorance or misunderstanding." It is therefore neither strange nor surprising, even in the olden days, the contents of science have always been incorporated to some extent in the school curriculum. With the recent explosion in science and technology and the extraordinary power it has given us to impact the environment and human health (sometimes adversely) combined with the proliferation of the specialized disciplines under the STEM umbrella, the higher education sector has the obligation to encourage the majority non-science students to dwell deeper into science - the State of Knowing! This implies that every faculty has to ensure that every non-science major student gets interested in science.

At Savannah State University, I teach Integrated Science (ISCI), a core course designed for students who have chosen to major in disciplines which are generally called non-science majors. At the start of the course, most of these students consider themselves to have an acute dislike for mathematics and science. They lack interest and wonder why they should take this Integrated Science course. Though, for me, an experienced professor in teaching, in the beginning this posed a challenge because it is not just teaching - business as usual! I had to design a curriculum and syllabus incorporating appropriate subject matter picked out from the ocean of science material, to deliver it appropriately (lectures, demonstration, lab experiments, field visits, current news, etc.), and most of all to engage the students (a class of about thirty-five students and three such sections) so that, if not right at the beginning, at least by mid-term, they will not only appreciate its importance but love SCIENCE!

Goal of the Activity

My goal is to make sure all the discovery learning activities developed for this course meet the objectives of engaged learning through ensuring their active participation, critical thinking, as well as visual and analytical skills while learning the subject with interest and appreciation. Generally, every semester, I conduct a minimum of six discovery learning activities along with video presentations and lectures to cover this course. The discovery learning activity described in this manuscript represents the collective team work each student who is personally responsible for recording measurements in time and then submit the computation and final report in the next class meeting.

Activity Description - Radiation Measurement

This involves measuring background radiation and radiation from standard Alpha, Beta and Gamma radiation-producing samples in the presence / absence of various calibrated absorber shields. We are

constantly exposed to a wide variety of radiation like cosmic rays, soils, and from other materials. In this experiment, the students measure the background radiation by Geiger Muller Counter. Measured sample activity must be corrected by subtracting the background counts. Radiation is a random event that could be minimized / prevented using appropriate shield material.

Apparatus
SPECTECH ST 360 G-M Tube, Counter and calibrated absorber shields

Sources
Alpha (**α**) source:

a. Po-0.1 μ Ci, Half-life 138.4 days

Beta (**β**) source:

a. Sr-90 0.1 μ Ci, Half-life 28.8 years,
b. Ti-204 1.0 μ Ci, Half-life 3.78 years

Gamma (**γ**) source:

a. Co-60, 1.0 μ Ci, Half-life 5.27 years.

Presentation of Observation and Results
Observations and calculations are presented in a Table Format shown below.

Selected Student feedback

This lab helped me to become more conscious of how much I expose myself to [radiation].

It was an eye opening lab to learn about radiation and how it affects the world & us as humans.

Our radiation lab was very interesting. I know that I am probably exposed to radiation in some form as a Radio Personality from equipment used in Mass Communication.

I found this lab to be very informative and learned something new being that I am a business major.

Conclusions

The feedback from students reveal that the students enjoyed their engagement in the rigorous learning process used in this discovery learning radiation measurement lab, and it helped them to learn new information that could affect their life. Even though almost all the students in this class are non-science majors, the best practices (processes) used in the implementation of this discovery learning model made them to be more comfortable to understand the high-tech science (one faces in everyday life) in a very simple way. It also taught students punctuality, time management and submission of lab reports in a professional style. Looking back, the interest the non-science major students developed in science, their performance and their feedback confirm Winston Churchill's words "Continuous effort - not strength or intelligence - is the key to unlocking our potential."

Table 8: Results for Integrated Science II – SPRING 2020 – Discovery Exercise 1

Lab Date: Jan 27, 2020 Report Due Date: Jan 28, 2020

Type of Radiation	Sources	Absorber Shield Used	Radiation [COUNTS PER 10 SECONDS]			Average Radiation (CPM) = [(Average of R1+R2+R3/3) x 6] [CPM = COUNTS PER MINUTES]	Average Net Radiation Activity (CPM) [Avg Radiation-Avg Background]
			Run-1	Run-2	Run-3		
None	Background		3	7	3	=[((3+7+3)/3)x6] = 26	= 26
Alpha (α)	Po	None	7	5	6	=[((7+5+6)/3)x6] = 36	=(36-26) = 10
		B	3	8	6	=[((3+8+6))/3)x6] = 34	=(34-26) = 08
		D	7	5	5	=[((7+5+5))/3)x6] = 34	=(34-26) = 08
		F	5	9	11	=[((5+9+11)/3)x6] = 50	=(50-26) = 24
		P	4	7	6	=[((4+7+6))/3)x6] = 34	=(34-26) = 08
		S	3	6	11	=[((3+6+11)/3)x6] = 40	=(40-26) = 14
Beta (β)	Sr	None					
		B					
		D					
		F					
		P					
		S					
	Ti	None					
		B					
		D					
		F					
		P					
		S					
Gamma (ϒ)	Co	None					
		B					
		D					
		F					
		P					
		S					

Description of Absorber Shields

B *[1 Mil Al Foil – 6.5 mg cm²]*; **D** *[8 Mil Poly – 19.2 mg cm2];* **F** *[0.040 Plastic –1021 mg cm²];* **P** *[0.125 Al –840 mg cm²];* **S** [0.125 Pb –3448 mg cm²]

Students Engaged in Discovery Learning Radiation Measurement Laboratory







Learning Communities and Assessment for Freshmen History Majors

Barney Rickman
Melanie Byrd
Deborah Davis
Valdosta State University

Author Biographies

After earning his PhD in History in 1990 at the University of Connecticut, Barney Rickman accepted a tenure track appointment at Valdosta State University. A historian of U.S.-Japanese diplomatic relations, Dr. Rickman has published in the *Southeast Review of Asian Studies* as well as the *Journal of the Georgia Association of Historians.* In 2006, Dr. Rickman was awarded Valdosta State's Excellence in Teaching Award, and he received Valdosta State's Excellence in Advising Award in 2010. In July 2019, Dr. Rickman began service as the Interim Head of the History Department at VSU.

Melanie Byrd, originally from Cuyahoga Falls, Ohio, earned BA and MA degrees in History from the University of Akron in Akron, Ohio as well as a MLIS from Kent State University in Ohio. She received her PhD in History from Florida State University in 1992, and has been a History professor at Valdosta State University since 1993. Dr. Byrd teaches ancient, world, and European history, plus the senior seminar, in which library research is an integral part.

Deborah Davis is a Certified Archivist, a Full Professor, and the Director of the Valdosta State University Archives and Special Collections. She also teaches for the VSU's MLIS Department and the VSU History Department. As an archivist, Ms. Davis focuses on teaching, reference, outreach, and administration. In 2018 she was awarded the VSU President's Award for Service Excellence. She has also won awards from the Georgia Historical Records Advisory Board, the Consortium for Belize Educational Cooperation, and the African American studies program at VSU. Ms. Davis is the author of several articles and a book, *Valdosta State University* (2001).

In 2008, the History faculty at Valdosta State University (VSU) implemented a first-year learning community to improve retention and academic success within our major. Starting fall 2019, incoming History majors were encouraged to take a course designed specifically for students beginning a major in History. The class, "Archive/Library for Historians," was team-taught by Professors Melanie Byrd (History) and Deborah Davis (VSU Archives) and could be used for credit in Area B of the Core Curriculum. The course number was PERS 2299 as all Area B classes at VSU have the PERS designation. Of the twelve freshman students who identified as planning to major in History, eight were able to fit PERS 2299 into their fall schedule; time conflicts with team practice prevented several student athletes from enrolling in the class.

A key learning outcome for PERS 2299 was to introduce first-year students to the use of libraries and archives, with an emphasis on historical research and analysis. By the end of the class, each student produced a term paper (5-7 pages) based on archival research on a topic connected to the Civil Rights Era; each student was also required to present the results of their research and analysis to the class. Course assignments early in the term involved exercises in how to frame a research question, how to find materials, how to determine an author's thesis, and an introduction to the concept of historiography.

The History faculty hope that this new class will help our majors be better prepared for the sophomore-year History 3000: Study of History. All majors take History 3000 as, or concurrently with, their first upper-division history course. This course provides students with further background on the discipline of history and the skills (research, analysis, writing, and discussion) essential to historical study and all upper-division courses in the major. Students complete the major with History 4950: Senior Seminar. The Senior Seminar

measures student progress in the mastery of oral and written communication as well as the acquisition of skills in critical analysis and historical interpretation.

Course evaluation comments demonstrate that PERS 2299 achieved its objectives for some students. "This course taught me how to complete research correctly and dig deeper into information." "The best feature was getting a tour of the archives and the library. Another great feature was getting to use the archives in class." Two of the PERS 2299 students, moreover, had their term papers accepted for the 2020 Georgia Collegiate Honor's Council conference[4] (Georgia Collegiate Honor's Council Conference, 2020).

In spring 2020, the retention rate for PERS 2299 students was 88%. This data is consistent with the fall term to spring term retention rate for History majors in recent years[5] but what will be interesting is if there is an increase in the six-year graduation rate as these PERS 2299 students progress toward graduation. For the cohorts who started VSU in fall 2012 and fall 2013, the 6-year graduation rate for History majors averaged around 50% which was above the general VSU 6-year graduation rate of 42% for fall 2012 and just below the USG System graduation rate of 52% for fall 2012[6].

Professors Byrd and Davis plan to revise the course for fall 2020. The PERS 2299 course structure relied heavily on a scaffolding approach in which each assignment early in the term built skills for success in the term paper at the end of the semester, but this structure was undermined when freshmen students missed class. Students who missed a number of classes early in the fall struggled on the term paper since they did not complete the earlier skill-building assignments. Prior to fall 2020, Professors Byrd and Davis will restructure the class so that first-year students have greater incentives to attend class as well as arrive to class with the assigned readings completed.

Dr. Byrd has also chaired the Department's Assessment Committee for almost two decades. She played a key role in creating (and revising) the assessment instruments used in HIST 3000 and 4950, and she incorporated an assessment process in PERS 2299 as well. Specifically, along with Ms. Davis, Dr. Byrd created a pre-test for PERS 2299 that introduced the students to some of the key concepts they would learn in the course -- concepts that would help them achieve greater academic success in their later History courses.

The multiple-choice PERS 2299 pre-test included questions such as

1. What is a primary source?
    a) the main source that an historian uses in research
    b) a source based on careful, detailed historical analysis
    c) a firsthand source that was originally produced during the period that an historian is researching
2. What is a secondary source?
    a) a source produced after the time period that an historian is researching
    b) information found in an archive
    c) the second most important source that an historian uses
3. What is a tertiary source?
    a) a non-print source such as a film or painting
    b) a source produced more than a century after the events that it discusses
    c) a source that condenses or indexes other sources, such as an encyclopedia

[4] https://www.mga.edu/georgia-collegiate-honors-council/index.php
[5] http://www.valdosta.edu/administration/institutional-research/
[6] https://www.valdosta.edu/administration/institutional-research/documents/enrollment-graduation-retention/retention_graduation_2018.pdf

4. A concise summary of the main assertion or argument presented in a piece of historical research, found near the introduction or beginning of the piece of research is called:
    a) a thesis statement
    b) historical evidence
    c) an abstract
5. What is historiography?
    a) study of the history, theory, philosophy, and interpretations of history
    b) use of in-person interviews in historical research
    c) research that examines social interactions and cultural values of a given era

Although we cannot predict the outcome of the current process of Core Curriculum revision within the USG, the History faculty at Valdosta State University see the course created by Professors Byrd and Davis as a central component of improving the academic success of our majors.