## Application Summary

### Competition Details

<table>
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<tr>
<th>Competition Title</th>
<th>2021 Scholarship of Teaching and Learning Award</th>
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<td>Category</td>
<td>Institutional Awards - CTL</td>
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### Application Information

<table>
<thead>
<tr>
<th>Submitted By</th>
<th>Michele Yager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application ID</td>
<td>5950</td>
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<tr>
<td>Application Title</td>
<td>Michael Evans and Carrie Shepler (joint nomination)</td>
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<tr>
<td>Date Submitted</td>
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### Personal Details

<table>
<thead>
<tr>
<th>Applicant First Name</th>
<th>Michael</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicant Last Name</td>
<td>Evans</td>
</tr>
<tr>
<td>Email Address</td>
<td><a href="mailto:michael.evans@chemistry.gatech.edu">michael.evans@chemistry.gatech.edu</a></td>
</tr>
<tr>
<td>Phone Number</td>
<td>(404) 385-8166</td>
</tr>
<tr>
<td>Primary School or Department</td>
<td>School of Chemistry and Biochemistry</td>
</tr>
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| Primary Appointment Title  | Freshman Chemistry Laboratory Coordinator    |

### Application Details

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<th>Proposal Title</th>
<th>Michael Evans and Carrie Shepler (joint nomination)</th>
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2021 Scholarship of Teaching and Learning Award Nomination
Drs. Carrie Shepler and Michael Evans

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February 26, 2021

To Whom It May Concern:

I write with the greatest enthusiasm to nominate Drs. Carrie Shepler and Michael Evans for the **2021 Scholarship of Teaching and Learning Award**. These two highly valued colleagues have long been leaders in instructional innovation within our School. They have also made an impact on the wider community of educators in chemistry by making well-received presentations at conferences and publishing peer-reviewed work of the highest quality.

This particular nomination is occasioned by a recent joint publication in the *Journal of Chemical Education* – the premier international journal in this field – describing a unique model for remote laboratory instruction (“Synchronous Online-Delivery: A Novel Approach to Online Lab Instruction,” 2021, [https://dx.doi.org/acs.jchemed.0c01365](https://dx.doi.org/acs.jchemed.0c01365)). As explained more fully in the enclosed application materials, their efforts made an extraordinary difference in our response to the COVID pandemic, enabling us to retain and even enhance much of our laboratory curriculum when it was impossible to present these courses in the usual way.

In addition, Dr. Evans has developed a robust program in which undergraduates are engaged in chemistry education research. In these endeavors, Evans and his students have explored a variety of subjects, including the development of laboratory experiments on sustainability, studies of student self-efficacy and attitudes in organic chemistry lectures and labs, and studies of educational technologies for organic chemistry. The last two of these resulted in another recent *J. Chem. Ed.* publication (“The Shrewd Guess: Can a Software System Assist Students in Hypothesis-Driven Learning for Organic Chemistry?” 2020, [https://dx.doi.org/10.1021/acs.jchemed.0c00246](https://dx.doi.org/10.1021/acs.jchemed.0c00246)). Through this work, Dr. Evans has markedly improved instruction within our School while inspiring several students to pursue academic careers.

Dr. Shepler has long been recognized as one of our most effective teachers and a generous role model for faculty and students alike. She spearheaded the development of the remote Chemical Principles I laboratory described in the first of the aforementioned publications, using a novel instructional model centered on student collaboration and interactive simulations. Dr. Shepler has also regularly presented at conferences in chemistry education to bring the best practices from around the country to Georgia Tech and to share our experiences teaching large coordinated introductory chemistry courses.

As educational innovators within our School who have been highly effective in bringing creativity, rigor, and evidence-based assessment to bear on their teaching effectiveness, these two colleagues are outstanding candidates for this award.

Sincerely,

M.G. Finn, Ph.D.
Professor and Chair, School of Chemistry & Biochemistry
James A. Carlos Family Chair for Pediatric Technology
Teaching Philosophy Statement
Michael Evans
February 2021

Great teaching in chemistry transports students to the sub-microscopic world of atoms and molecules and empowers them to investigate, explain, and apply complex chemical phenomena. I believe that chemistry is not only the central science, but also the most human science: a discipline that incorporates empirical observation, measurement, and model-building using concepts that we cannot see directly but that tap into profoundly rational ways of thinking about the world. This mixture of the macroscopic, sub-microscopic, and symbolic is unique to chemistry. I love engaging students in the process of model-building through analysis of laboratory data and grappling with real data sets in lecture courses. In this respect, I see my role as helping to train the next generation of builders of scientific models, regardless of the specific disciplines in which they end up. I believe chemistry has something important to teach every student about scientific thinking as long as I meet the goal of teaching for transfer.

Among the transferable skills that appear in both my general and organic chemistry courses, reasoning by analogy is one of the most important. I believe that to confidently use analogical reasoning, students require very deliberate exposure to analogous problems and concepts. In my organic chemistry courses, I have developed problem sets specifically designed to help students recognize structural and mechanistic analogies and much of the feedback I provide to students points to these analogies. In my research with students solving organic chemistry problems in a “think-aloud” mode, I actively look for students using analogic reasoning.

Teaching large introductory laboratory courses has given me an appreciation of the mentoring, coordination, and delegation required to run a course primarily taught by graduate teaching assistants. Training graduate students to be good teachers is not as simple as handing them a set of slides and sending them on their way. I believe in maintaining complete transparency with teaching assistants with respect to my teaching philosophy and engaging in a conversation with them about what they find effective as teachers. Although not all graduate students are receptive to the idea of spending time teaching, I strive to convince them that the communication and reasoning skills they will develop as teaching assistants will serve them well in a research context. I also actively express concern for their well-being and ask them to do the same for their students. I believe that the human element of mentoring TA’s is as important as—if not more important than—the technical element.

For students in the chemistry laboratory, I believe that negative emotional responses to the content and environment represent the single biggest roadblock to academic success. Feelings of anxiety, helplessness, and frustration limit students’ ability to operate with confidence independently in the laboratory. With this in mind, I devote considerable attention in my courses to developing materials that help students prepare to enter the laboratory with confidence and comfort. My research efforts investigating the self-efficacy and affective learning of organic chemistry laboratory students is aimed at improving instruction via helping students overcome emotional roadblocks.
I am inspired by the potential of educational technologies (including those that are not so traditionally “educational”!) to improve chemistry education. Visualization of atoms and molecules is central to how chemists think but can be a significant challenge for students not accustomed to applying qualitative visual models of chemical behavior. In studying how students engage with technologies that facilitate visualizations, such as simulations in the introductory chemistry laboratory and applications to help students visualize organic reaction mechanisms, I hope to illuminate the effectiveness of these technologies in improving student learning. Using educational technology with purpose is central to my teaching philosophy; as such, research investigating how students use digital tools and resources (for better or worse) is a natural part of my practice.
Teaching Philosophy
Carrie Shepler

Conceptual understanding, metacognition, the development of critical thinking skills, communication, and the creation of a safe and inclusive learning environment are the foundations of my teaching philosophy. Though these have been integral parts of my philosophy for many years, my approaches to these key components have evolved significantly throughout my career.

I was heavily influenced in my early years of teaching by participation in research that focused on what introductory level chemistry students think as they attempt to solve chemistry problems. Nearly two years of conducting semi-structured interviews with students provided invaluable insight into the delicate balance of cognitive psychology, language, and chemistry concepts as students navigate introductory chemistry courses. This experience still impacts the way I approach teaching chemistry today; indeed, specific non-chemical words as I teach certain topics and analogies to help students understand given concepts are direct results of these interviews.

Moving forward in my career, my specific job responsibilities left less time for developing my own evidence-based pedagogical approaches. I began to rely more on education literature as a guide. For example, the learning reflections that I ask students to complete evolved from the “exam wrappers” described by Ambrose, et al (2010) while documented problem solving is a technique gleaned from Cross and Angelo’s seminal work, Classroom Assessment Techniques (1993). In more recent years, my approach has been influenced by the work of Brown (2014) in Make It Stick: the Science of Successful Learning. For example, I often use a “warm up” question at the beginning of class that is a review of concepts from the previous period as a means of increasing exposure to material and aiding in retrieval practice.

I believe that students have the best learning experiences when they become members of an engaged classroom community. Inspired by a seminar given by Richard Felder (North Carolina State University), I began a very slow transition to a flipped classroom model as a means of engaging students more significantly in the classroom. This began with very brief think-pair-share exercises, and over the course of several years I worked my way up to classes that were about 50% active lecture and 50% problem-solving based on flipped content.

The COVID-19 pandemic caused all teachers to make changes to their pedagogical approaches, and in my case the result was a transition to a completely flipped classroom. Because I believe that students need to be engaged in both the in-class and out-of-class portions of a flipped classroom experience, the structure of my flipped classroom includes a note-taking structure, introduction and summary material for each content based video, and pre-lecture quizzes with questions woven into the video structure.

In my experience, success in the classroom is rooted in good communication between students and the instructor, and this has been particularly true with respect to the flipped classroom. My course structures include opportunities for students to provide feedback to me and to reflect on the efficacy of their own learning practices three or four times during the semester. Though the structure and content of the assessment has evolved over time, I consistently ask students for feedback on what is working well, what I can change to facilitate their learning, and what changes they can make to improve their learning experience. I make a concerted effort to discuss the feedback with the class with particular emphasis on why I do or do not do specific things in my classes. This “feedback-based” pedagogical approach has become a cornerstone of my teaching philosophy.
Feedback and communication in the classroom never have been more important than in the COVID-19 era. I am fortunate to work with colleagues who encouraged me that our students’ feedback can have broader impact, and this was the foundation of our recent work examining student expectations versus experience in synchronous online-delivery laboratories. We are extending the work to hybrid and residential laboratories, and comparisons between delivery modes may elucidate aspects of introductory laboratory courses that have impact far beyond the COVID-19 era. This reminder that my classrooms are research spaces where discoveries can be made that are beneficial to a community outside of my classroom has been a bright spot in a difficult time. I am eager to return to my roots in chemistry education and for my teaching to be more informed by evidence gleaned from our own classrooms moving forward.

I am firm in the belief that it is essential to create an inclusive classroom environment. Students of diverse backgrounds and experiences should feel safe participating and taking educational chances in front of their classmates and me. For many years, my primary means of enacting this goal was to model the respect, integrity, and open-mindedness that I would like my students to display to one another. However, the past year has taught me that this is no longer sufficient. Buoyed by literature-based conversation with colleagues, I have begun to address in the classroom the world in which we live and the impact that it has on my students as well as to highlight the contributions of scientists from under-represented groups during class. I often am inelegant, but feedback from students helps me understand that they respect my imperfect attempts. In many ways, I am modeling for them what I have tried to teach them about learning – that it is okay if you don’t get it at first, that multiple exposures result in comfort with the subject, that practice is vital for success, and that effort will pay off eventually.

References


Evidence of Impact on Student Learning and Chemistry Education Practice

Synchronous Online Delivery in Introductory Chemistry Laboratory Instruction

Our recent publication\(^1\) in the *Journal of Chemical Education* describes the development and implementation of a *synchronous online delivery (SOD)* model for remote laboratory instruction. This model has been underreported in the chemistry education literature but provides a low-cost and pedagogically effective method for chemical laboratory instruction centered on simulations of the macroscopic and sub-microscopic levels. Implementation of a modified version of a previously validated survey (the Meaningful Learning in Laboratory instrument, MLLI\(^2\)) demonstrated that this model does promote meaningful learning in both cognitive and affective respects.

The graph below provides a “report card” of our MLLI results for CHEM 1212K and 1310, which were both taught using the SOD model. The results demonstrated that most students reported “Good” or “Excellent” learning in a variety of areas.

![Graph showing MLLI results for CHEM 1212K and 1310](image)

This work also uncovered some intriguing differences between the two courses and between first-year and continuing (“returning”) students. For example, the graph below is an affective report card illustrating results by course and by first-year/returning in CHEM 1310. Although the preponderance of Poor ratings by first-year students in CHEM 1310 is concerning, this result has provided us with focus for improving the course as we implement the SOD model in the future. In addition, we observed that first-year students reported higher levels of community than returning students and that they appreciated the opportunity to complete experiments collaboratively, a central pillar of the SOD model.

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\(^{1}\) Jones, E. V.; Shepler, C. G.; Evans. M. J. *J. Chem. Educ.* 2021, ASAP.  
https://doi.org/10.1021/acs.jchemed.0c01365

https://doi.org/10.1021/acs.jchemed.5b00754
SOD laboratories may not be a universal fit for all institutions, especially those with more limited instructor resources or with a majority of students in different time zones. For us, it was the best way to leverage the collective enthusiasm of our students and instructors and created the most collaborative remote lab environment. Moving forward, we will take many of the lessons learned from these inaugural online lab courses into courses of all delivery modes. When reflecting on student survey responses as well as experiences of course facilitators, two sentiments resonate strongly. First, students expressed preference and gratitude for a synchronous online lab environment over asynchronous. This is tied closely to their belief they learned more from their material in the collaboration with classmates and a graduate student TA.

Second, special attention needs to be paid to increase affective learning in all lab courses. We are still reflecting, learning, and adapting as we better understand the unique needs of SOD lab environments and students taking courses during a pandemic. While we will at some point be on the other side of the ongoing pandemic, there is no strong evidence traditional FTF laboratories are any better for affective learning. We hope this strange and disruptive period is also a time of reflection for our community, to assess the best path forward for laboratories in a return to “normal”.

**Implementation and Studies of a Mobile Application for Organic Reaction Mechanisms**

Drawing, analyzing, and applying reaction mechanisms represent a challenging area for students of organic chemistry courses. Over multiple semesters, the Evans research group has studied how students solve problems in a mobile application for depicting organic reaction mechanisms (“Mechanisms”). This qualitative think-aloud study culminated in a set of recommendations for students in CHEM 2311 and 2312 using the app to learn and practice organic chemistry. Additional efficacy studies were reported in a 2020 publication in the *Journal of Chemical Education*³ including ME as an author.

A series of undergraduate researchers transcribed and coded think-aloud interviews with students to look for general themes of the student thought process as they work through Mechanisms problems. The work uncovered conceptual and technological roadblocks and some intriguing interactions between technical difficulties and application of chemistry concepts; namely, technological frustration was coupled to diminished application of complex concepts. Chemical nomenclature was also identified as a significant roadblock to thinking aloud while solving problems in organic chemistry. Although this work has not yet been published, it has provided important insights that have been applied in the use of Mechanisms in CHEM 2311 and 2312 taught by ME.

**Improving Student Self-efficacy in the Organic Chemistry Laboratory (CHEM 2380) via a Weekly Reflection Prompt**

A relatively recent project in the Evans research group involves assessment of student self-efficacy through the administration of previously validated survey instruments (the Motivated Strategies for Learning Questionnaire, MSLQ,\(^4\) and the Chemistry Laboratory Anxiety Instrument, CLAI\(^5\)). Application of the survey in Fall 2020 illuminated a need to improve self-efficacy in CHEM 2380. Thus, an undergraduate researcher developed a weekly intervention involving metacognitive reflection on the week’s experiment. We are currently in the midst of the intervention as well as data collection but are excited by the potential of this project to demonstrate the efficacy of metacognitive interventions on improving affective learning outcomes in the organic chemistry laboratory.

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I. EARNED DEGREES

University of Illinois, Urbana-Champaign 2008 – 2013
Degree Obtained: Ph.D. Chemistry
Doctoral Advisor: Prof. Jeffrey Moore
Title of Dissertation: “Development and analysis of educational technologies for a blended organic chemistry course”

University of Kentucky 2004 – 2008
Degree Obtained: B.S. Chemistry, Mathematics minor
Cumulative GPA: 3.92

II. EMPLOYMENT HISTORY

Georgia Institute of Technology 8/2018 – present
Senior Academic Professional

Georgia Institute of Technology 7/2013 – 7/2018
Academic Professional

University of Illinois, Urbana-Champaign 8/2008 – 6/2013
Graduate Research Assistant

III. HONORS AND AWARDS

Serve-Learn-Sustain Climate Change Fellow 2018
GT 1000 (Freshman Seminar) Instructor of the Year 2016
Georgia Tech Center for Enhancement of Teaching and Learning Teaching Scholar 2015
Georgia Tech Thank-a-Teacher Awardee 2015 – 2020

IV. EDUCATION AND MENTORSHIP

A. RESEARCH ADVISING AND GUIDANCE

The students below worked on the research project Self-efficacy of Students in Organic Chemistry Lecture and Laboratory Courses.

Anna Rappaport  undergraduate  Spring 2021
Noelle Calomeni  undergraduate  Fall 2020

The students below worked on the research project Think-aloud Studies of Student Use of an App for Organic Reaction Mechanisms.

Chandler Watson  undergraduate  Fall 2019
Zongru Wen  undergraduate  Fall 2019
Kodi Nix  undergraduate  Spring 2019 – Fall 2019
Sabrina Gallego  undergraduate  Spring 2019
The students below worked on the research project *Optical Recognition of Hand-drawn Chemical Structures*.

Grant Marshall  
undergraduate  
Spring 2019

The students below worked on the research project *Experiments Highlighting Sustainability in the First-year Chemistry Laboratories*.

Darshan Senthil  
undergraduate  
Fall 2017 – Fall 2018

Andrew Barnett  
undergraduate  
Spring 2018

Chloe Baskowitz  
undergraduate  
Spring 2018

Nina Lyow  
undergraduate  
Spring 2018

V. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

A. PUBLICATIONS


B. PRESENTATIONS


2. *Evans, M. (2018, August). Molecular Gastronomists at Georgia Tech: A student club at the intersection of science, culture, and food. Presented at the national meeting of the American Chemical Society, Boston, MA.


CARRIE G. SHEPLER

PRINCIPAL ACADEMIC PROFESSIONAL AND DIRECTOR OF INSTRUCTIONAL ACTIVITIES AND STUDENT EXPERIENCE

SCHOOL OF CHEMISTRY AND BIOCHEMISTRY

I. EARNED DEGREES

Ph.D., Chemistry                   Washington State University, Pullman, WA   2005
Thesis: The Biogeochemical Transformation of Simple U(VI) Oxyhydroxides to U(VI) Phosphates
Advisor: Professor Sue B. Clark

B.S., Chemistry                    Georgetown College, Georgetown, KY     2000
Second Major: Communication Arts

II. EMPLOYMENT HISTORY

Principal Academic Professional             2019-present
Senior Academic Professional              2013-2019
Academic Professional                     2008-2013

School of Chemistry and Biochemistry      Atlanta, GA
Georgia Institute of Technology

Franklin Teaching Post-Doctoral Fellow     Athens, GA       2006-2008
Department of Chemistry
University of Georgia

Temporary Instructor                     Pullman, WA       2005, 2006
Department of Chemistry
Washington State University

Post-Doctoral Researcher                  Pullman, WA       2005
Department of Chemistry
Washington State University

III. HONORS AND AWARDS

Georgia Institute of Technology

Student Recognition of Excellence in Teaching: Class of 1934 Award 2020, 2021
Billiee Pendleton-Parker Award for Outstanding Allyship (LGBTQIA Resource Center) 2019
Access Ally Award, Office of Disabilities Services 2017
Eric R. Immel Memorial Award for Excellence in Teaching, College of Sciences 2016
Friend of New Student and Sophomore Programs faculty award 2016
Freshman Advisory Board “Freshman Professor of the Year” 2010, 2011, 2015, 2016
ANAK Faculty Award 2015
Class of 1940 W. Roane Beard Outstanding Teacher Award 2011
Outstanding Undergraduate Academic Advisor, faculty 2010

IV. EDUCATIONAL INNOVATIONS AND OTHER CONTRIBUTIONS

Georgia Institute of Technology

- Development of completely remote (lab and lecture) versions of CHEM 1211K, 1212K, and 1310 in response to COVID-19
• Development of videos for use in “flipped” classroom approach.
  o CHEM 1211K representative videos:
    - https://www.youtube.com/watch?v=DaIhKICSekQ
    - https://www.youtube.com/watch?v=ugrosgb6kTc
  o CHEM 1212K representative videos:
    - https://www.youtube.com/watch?v=_04yL-D-Owc
    - https://www.youtube.com/watch?v=J4rpZBdWz7U
  o CHEM 1310 representative videos
    - https://www.youtube.com/watch?v=O6IbCVtHrs
    - https://www.youtube.com/watch?v=F2YZ-QCIs2o
  o CHEM 2211/2214 representative videos:
    - https://www.youtube.com/watch?v=mtc7vQKzmDc
    - https://www.youtube.com/watch?v=HHepIBiIh0U

• Significant contribution to all lecture slides, recitation materials, homework sets, and exams for CHEM 1211K, 1212K, and 1310
• Co-development of the curriculum for CHEM 2801 PS, Professional Skills for Chemists and Biochemists with Professor Angus Wilkinson
• Co-development of “study tip of the day” material for CHEM 1211K, 1212K, and 1310 with Dr. Cianan Russell and Dr. Kimberly Schurmeier
• Development of a School peer-to-peer mentoring program
• Development and delivery of a study and learning skills presentation for CHEM 1212K
• Development of safety slides for laboratories of CHEM 1211K, 1212K, and 1310
• Pilot of Intellus curation platform to develop materials to replace the textbook for CHEM 1310

VI. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

A. REPRESENTATIVE PUBLICATIONS

E. V. Jones, C.G. Shepler, and M.J. Evans. “Synchronous Online Delivery: A Novel Approach to Online Lab Instruction.” Journal of Chemical Education, volume XX, issue XX, pp. XXX. doi.org/10.1021/acs/jchemed.0c01365


B. REPRESENTATIVE PRESENTATIONS

Submitted presentations
*C.G. Shepler. “Honoring individual teaching philosophies in a coordinated introductory chemistry program”. Presented at the Biennial Conference on Chemistry Education, South Bend, IN, 2018.


**Invited Presentations**


*C.G. Shepler. “Active Learning in Large Classrooms.” Invited seminar, Eastern Kentucky University, Department of Chemistry, April 2014.


C.H. Atwood, K.D. Schurmeier, and C.G. Shepler. “Using Computerized Assessment to Inform Improved Teaching Practices” presented to the faculty and staff of the University of Georgia, University Faculty Symposium held at Unicoo State Park in Helen, GA, March, 2007.

**VII. REPRESENTATIVE SERVICE**

*Journal of Chemical Education*, manuscript reviewer 2014, 2020

Cengage Publishing, advisory group 2017

Cengage Publishing, general chemistry advisory board 2013

Project Kaleidoscope, Atlanta Regional Network planning committee 2013

American Chemical Society 2nd Term General Chemistry Exam Committee 2012-2014
February 27th, 2021

To Whom it May Concern:

It is a great pleasure to support the joint nomination of Dr. Michael Evans and Dr. Carrie Shepler for the Institute’s “Scholarship of Teaching and Learning Award”. Both Drs Shepler and Evans are very energetic and highly talented educators, with philosophies honed over years of classroom experience, and many awards for their teaching at Georgia Tech to their credit. They both also have a history of high quality scholarship in the area of Chemical Education, which I will briefly outline below. However, it is their very recent work critically examining how students respond to virtual laboratory courses delivered in a synchronous online (SOD) format that I would like to emphasize. This work has resulted in a very nice peer reviewed publication, “Synchronous Online-Deliver: A Novel Approach to Online Lab Instruction” in *J. Chem. Ed.* (DOI:10.1021/acs.jchemed.0c01365), which is the most prestigious journal in its field.

Dr. Evans came to GT in 2013 from U. Illinois, Urbana-Champagne after completing a PhD focused the development and analysis of educational technology in organic chemistry instruction. At GT, he has implemented many valuable technological innovations in our first year and organic chemistry courses. He has also worked with a group of undergraduate research students to study the efficacy of software tools, such as the app “mechanisms”, for teaching organic chemistry. These activities have recently led to his co-authorship of a peer reviewed publication, “The Shrewd Guess: Can a Software System Assist Students in Hypothesis Driven Learning for Organic Chemistry”, *J. Chem. Ed.* 2020 (DOI: 10.1021/acs.jchemed.0c00246). Dr. Evans, amongst other duties, has management responsibility for our first year chemistry laboratory courses.

Dr. Shepler came to GT in 2008, after completing a Franklin teaching postdoctoral fellowship at UGA, where she had conducted educational research that led to co-authorship of a peer reviewed publication “Using Item Using Item Response Theory to Assess Changes in Student Performance Based on Changes in Question Wording” in J. Chem. Ed. (DOI:10.1021/ed100422c). At GT, among many other things, she has done a superb job of managing our first year chemistry courses.

As we approached the summer of 2020, Carrie and Mike had to come up with plan for the fully online delivery of our CHEM 1310 and 1212K courses, both of which have a major laboratory component. In many ways, the easiest option for them would have been delivery of the lab component in a fully asynchronous fashion, where students work alone on simulations and data analysis. However, their instincts as educators, and experience as we transitioned to fully remote in Spring 2020, suggested to them that this was not the right choice for our students. The decided to explore a Synchronous Online Delivery (SOD) model, where students work in pairs during scheduled class periods on simulations and problems, and a TA would visit the pairs in her/his
School of Chemistry and Biochemistry

virtual section to answer questions and provide help as needed. As there is very little known about
the efficacy of this approach, they undertook a study of it cognitive and affective efficacy. This is
very much a case of making lemonade when presented with COVID lemons. Working with a very
talented teaching assistant, Elizabeth Jones, they identified and adapted previously validated
survey tools in the laboratory education literature (Meaningful Learning in Laboratory Instrument,
MILI), which could be used to assess student cognitive and affective learning and put in place a
SOD laboratory curriculum. Findings from their initial work have now been published in the peer
reviewed literature and they undoubtedly will help shape the future of online chemistry laboratory
education. Their initial work reveals that students express a strong preference for synchronous
versus asynchronous laboratory instruction, due to their belief that interactions with lab partners
and TAs were very helpful for their learning. It also raises questions about how lab courses, in any
format, provide for good affective learning.

Both Dr. Evans and Shepler actively promote and support the scholarship of teaching and learning.
They have both engaged our graduate and undergraduate students in SOTL activities and, as such,
supported the students’ development as potential scholars in this area. They have also been
engaged in the recruitment of new instructional faculty to GT, for example Dr. William Howitz in
Fall 2020, who I believe has great potential for conducting high quality SOTL activities at GT in
the future.

In summary, I give my strongest support to the nomination of the Drs Evans and Shepler for the
Institute’s Scholarship of Teaching and Learning Award. Their recently published peer reviewed
work, examining the efficacy of synchronous online chemistry laboratory courses, is timely and
of very high quality. It will help shape the future of online first year chemistry laboratory
education.

Yours sincerely,

Angus P. Wilkinson
Assoc. Chair Academic Programs and Prof.