

Response to review letters from my prior evaluation

1 Introduction

Professor Armstead and I met on February 23 to discuss a few aspects related to the content of my 2021 portfolio. In response to that conversation, I have uploaded scans of the letters from my 2019 review and provide some of my reflections of the advice offered in those letters.

2 Teaching

The most recurrent theme in the 2019 review letters centered around various aspects of my teaching and my first-year experience with students at SUNY Cortland, which was unfortunately colored by a cheating scandal involving all of my students in my PHY 420 course (Fall 2018). This experience has been central to many of my thoughts, even long after the conclusion of that semester, and it is a thing that I hope I never have to see again in my time. One of my main conclusions from that situation was that we ended up there because students had not been properly challenged in their introductory courses, for a variety of reasons (too much to go into here), and therefore were lacking in some fundamental skills and knowledge that are critical for success in an upper-division physics courses. The seriousness of these problems was for a long while hidden from me in PHY 420 by the use of things like Chegg, which was a thing that I had only just begun to become aware of. Much of what has emerged in my teaching has been shaped by these early experiences, and I left that period with a renewed conviction that what we need is more focus on the fundamentals, increased rigor in introductory courses, and better student engagement.

Before discussing my responses to specific points raised in the letters, I would like to take a moment to offer a few more insights into particular matters that I may not have addressed fully elsewhere in this portfolio. One of these is the increase in my CTE scores for PHY 420. I was fortunate to have the opportunity to teach all of the 200-series courses three times, during which the greatest improvements were seen during my third term. I believe that the rapid growth in my CTE scores seen during this last year indicates that I have found something close to the sweet-spot of optimization. Unfortunately, I did not have the opportunity to teach PHY 420 a third time as in my other courses. However, last spring I taught a special topics 429/529 course (Classical Mechanics II/Advanced Classical Mechanics) that is the natural follow-on to PHY 420 (Classical Mechanics). Given the similarity of these courses, it is reasonable to combine data to get a better picture of my development arc in upper-division courses, as shown below.

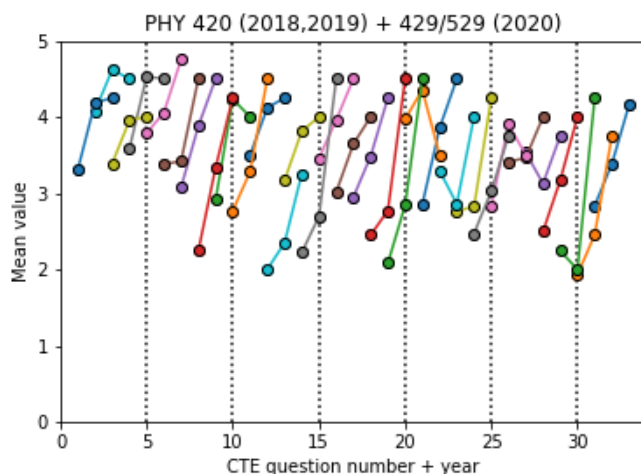


Figure 1: Combined PHY 420 and PHY 429/529 CTE scores showing the same significant growth in CTE scores demonstrated in my other courses, presented using the same system as in the other graphs in my CTE summary document.

Seeking additional classroom observations

The Science Sub-school Personnel Committee suggested that I should continue to seek peer observations, both internal and external to the Physics Department. I have a total of nine peer observations, in addition to informal observations by John Suarez and former Professor Brice Smith that did not result in letters. I have carefully read and reviewed the advice given in these letters and found much value there. Many discussions have resulted from these observations, and I would especially like to commend Professor Rena Janke for the many hours that she has discussed pedagogy with me and shared with me her wisdom as one who has specifically studied and taught teaching strategies. Along these lines it is perhaps important to note that I have conducted multiple peer observations of colleagues within the Physics Department, and am happy to be returning the favor to the College.

Working with the Institute for College Teaching and consulting with colleagues

Dean Mattingly suggested that I might benefit from talking with Dakin Burdick, the former director of our Institute for College Teaching. I followed his advice and established a relationship with Dakin. He and I had a number of productive conversations over the past few years, and ultimately collaborated last spring to create the “Faculty Lounge” space on Microsoft Teams as we transitioned into the distance learning phase of the Spring 2020 semester. I have also engaged in many conversations with colleagues, both internal to the Physics Department, within the College at-large with senior colleagues like Tom Pasquarello, Rena Janke, and Bob Spitzer, and with associates at other institutions.

Reflection on student comments from CTEs

The Physics Department Personnel Committee and Dean Mattingly both suggested that I had perhaps spent too much effort responding directly to individual student comments in my 2019 portfolio, and that it would perhaps be better to turn that effort toward a discussion of how I incorporate feedback into my courses and teaching. While I do not respond to any single student comment directly in this portfolio, all of these ideas are present in my recently revised statement of teaching philosophy that describes my observations and the changes I have made in response to the needs I have identified.

Reflection on my experience as an undergraduate

Provost Prus suggested in his letter that it may be useful for me to draw on my experience as an undergraduate. This is indeed an ongoing aspect of my reflections, as I compare what I see now to what I saw then. While there are many similarities between my alma mater, CSU Chico, and SUNY Cortland, there are also important differences, though I suspect that the greater share of these differences depends more on distance in time than distance in space. As part of my ongoing ruminating along these lines, I reached out Professor Lois Buchholtz at CSU Chico last summer. I asked him about his experiences over the last twenty years and what trends he has observed, whether he has seen a rise in the use of online resources like Chegg, and other matters related to student learning. He offered this interesting advice:

“We all notice the phenomena (regarding today’s students) that you mention so pungently. It’s real and it’s serious. There are still plenty of good ones, of course - but they are all - more or less - influenced by the times they live in. Much of it isn’t savory and it has confused the heck out of them. I’m sure you will come away with many lessons - and I encourage you to reflect deeply on it. I, for one, write all of my own problems (!) and keep the academic demands on students (of all kinds) near the breaking point. They are incredulous of course - but invariably grateful.”

While I am not quite as traditional as he is, I hold him in the highest esteem and consider him and my graduate advisor to be the most influential people in my academic pedigree. I fully believe that the CSU Chico students who have studied under Professor Buchholtz have benefitted from his rigor and passion more than they probably realized at the time, and that there is much of value in his approach to education.

3 Research

In the area of research, my activities have been quite diverse, including professional studies and design work in support of the PCI project with MIT and the Max Planck Insitute for Plasmaphysics, multiple student projects, technology developments, studies of contemporary pedagogical practices, and theoretical musings. In the following I offer some reflections on advice from the 2019 letters in regard to research.

Continue to publish

Provost Prus expressed his confidence that my track record in scholarly work would continue. At the time of the 2019 review I had published one paper as a lead author and two as co-author, and helped to co-author an MIT technical report with colleagues there. In January of 2021 I had a sole-authored article accepted for publication in the *American Journal of Physics*, which will be forthcoming later this year (I was told it could be 4-6 months due to a backlog of other papers in the queue). I was also lead author on a 2020 paper with Professor Szilvia Kadas of SUNY Cortland's Art & Art History Department, which discussed our interdisciplinary work conducted under the Common Problem Pedagogy project funded by Dean Mattingly's NSF grant. Professor Kadas and I repeated our collaboration, and recently submitted a second manuscript on this work, with her as lead author. I am also coauthor on another peer-reviewed paper by a colleague working on the MIT project, for a total of six peer-reviewed publications accepted/published in three years. Additional manuscripts are in various stages of development, with some under review, some nearly ready for review, and others still in the writing stage. I am looking forward to continuing to expand my scholarly activities and my publication record in the coming years.

Involvement of undergraduate students

The Science Sub-school Personnel Committee expressed an interest in seeing me continue to work with students. At the time of submission of my 2019 portfolio, I had taken a student (Nate Rose, '20) to Germany with me in the summer of 2018 following my first semester here (to clarify, in case it is not stated elsewhere: all of the stipends for students who have worked for me have been paid directly from my DOE grant). Since then, I have worked with five additional students, or an average of one per semester. Students have twice presented at Transformations events (2019 and 2020). Two of my students have continued to work with me long after their official independent study course was completed (Nate Rose and Karl Hipius). The work with Nate Rose culminated in a beautiful optics design tool, for which we submitted a SUNY Invention Disclose where Nate was a co-inventor. We also jointly submitted a proposal for the SUNY Technology Accelerator Fund program in the summer of 2020. Despite graduating at the end of the Fall 2020 semester, Karl Hipius continues to meet with me weekly to carry on our theoretical studies of nonlinear wave phenomena in our macroscopic quantum-analogy.

Continue to develop a productive research program at SUNY Cortland

Multiple letters commented on my plans to continue to develop programs at SUNY Cortland and to continue to pursue external grants. I am happy to say that a renewal proposal with collaborators from MIT was submitted to the US Department of Energy on January 25 of this year. Given our prior success and the strong support of the German research team in seeing our project continue, we are confident that this project will be renewed for another three years. Unfortunately, the serious upgrades to the W7-X stellarator have been further delayed due to work constraints imposed by the COVID-19 pandemic, and the current expectation is that new experiments will begin around December of 2022. There is, of course, always work to be done in the meanwhile. I am thankful to have a course release this spring that is allowing me to return to work that I have been unable to attend to for some time. The focus of this effort is on completing the optical design for the re-installation of the PCI diagnostic and development of new optical heterodyne system to be included in the near future. In support of this work I purchased about \$25k worth of new hardware over the last year and am aiming to have that work completed by the end of the coming summer.

As noted in my 2019 portfolio, I had multiple projects in development. I would like to specifically comment on the progress on the rotating turbulence experiment and the coupled-pendula experiment that I discussed in my 2019 portfolio. In short, both of these projects are coming along nicely. The coupled pendulum experiment has been the focus of three different student projects: Karl Hipius (theory and simulation), Tyler Edgar (experimental data collection), and Scott Blankenbaker (code development and data analysis). We had plans to embark on a series of experiments last spring that would have provided us with the data necessary to produce a nice experimental and theoretical study of this system. This endeavor was cut short by the pandemic, however, and continues to be on hold for the moment as I attempt to rally new student support for this project. I am hopeful that this may be possible this semester and am in the process of recruiting new student assistants.

The rotating turbulence experiment is nearly ready for operation. I put in a substantial effort last summer to machine additional components, wire the power supply and motor drives, and develop a LabVIEW interface to control the motors. While I wanted to carry this activity into the fall term, it simply was not feasible to continue this line of research with the immense burden of teaching presented by the Fall 2020 semester and my commitment to completing my *Interception and Rendezvous* paper, though I have no doubt it will come to fruition in the near future.

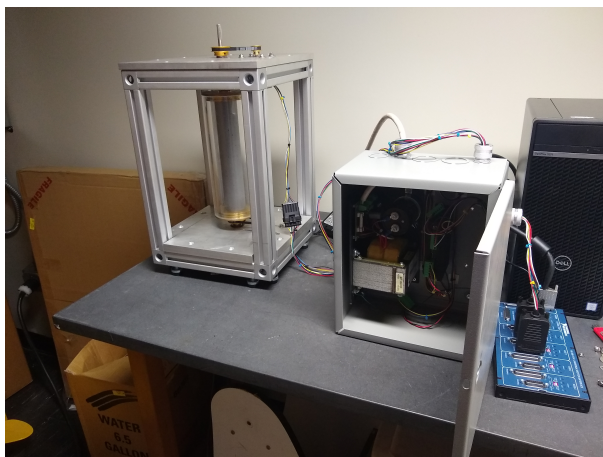


Figure 2: A recent picture of the rotating turbulence experiment in Bowers 133 showing the experimental apparatus (left), the power supply and motor drive box (middle) and computer interface (right).

4 Service

Prior letters indicated that my track record of service was commendable, if not beyond expectations for a first-year faculty member. There was some encouragement to continue to seek opportunities to support the College through committee work. I would like to emphasize that I have made this a priority through both formal and informal activities. I served as Chair of the Physics Department's 7-year program review where I led the effort at programmatic research, writing the report, and coordinating the visit of our external evaluators in April of 2020 (a virtual visit). I am also serving my second term as Chair of the Physics Department's Curriculum Committee, and recently launched 9 new Curriculog proposals for changes to courses and programs, things that emerged from a deep dive into a study of our programs that I undertook in the Fall 2020 semester that revealed a number of inefficiencies and places where GE courses were over-counted, which has allowed us to add much-needed supporting courses to a number of our programs. I continue to serve as an active member of the EPC and the Undergraduate-Alumni Science Symposium committees, as well as numerous other activities such as serving as a regular advisor for new and transfer students, the Program Coordinator for our 3+2 Physics-Engineering program, work with UUP, and other informal activities around campus such as the Online Teaching Group (Fall 2020). I look forward to continued opportunities to serve the Physics Department and the College.