

Assistant Professor

Department of Physics and Astronomy
Brigham Young University

Following the University's Rank and Status Policy document, I present a faculty development plan that will be used as a roadmap to gauge progress towards the third-year review and advancement to Continuing Faculty Status (CFS). This document focuses on the primary responsibilities – teaching, mentoring, scholarship, and citizenship – for a professorial faculty member of the Physics & Astronomy Department.

TEACHING

Philosophy: My vision for course development at all levels is that students will learn to apply scientific theories or laws to a variety of scenarios to predict behavior, thereby illuminating the “why” behind the formation, evolution, and demise of astrophysical objects.

I do not view students as blank canvases on which to paint the same terminology and concepts, and I am painfully aware that not all students learn at the same pace or in the same way. I continue to provide ample opportunity through after-class discussion or office hours (my own or the TAs) for students to improve their understanding through different approaches. I believe that any BYU student who appropriately uses their agency to seek out learning – and help when needed – will be able to pass the course and achieve all the course Learning Outcomes.

INTRODUCTORY LEVEL: I believe that students are best served when the instructor does more than introduce basic astronomical jargon and general object classifications. In-class activities and homework focus on applying fundamental scientific laws and to help develop critical reasoning skills. Afterwards, students will become more *discerning consumers* of astronomical news and discovery in this golden age of astronomy.

UPPER-LEVEL AND GRADUATE COURSES: I strive to build on (or introduce) increasingly complex topics by appealing to foundational principles that are operative on many scales. At this level, I expect students to have come to class prepared after completing reading assignments. I strongly encourage group study to develop new perspectives on how to approach problems, which will be crucial for their continued success in academia. For the upper-level courses, I seek to help students transition to become independent learners in preparation for graduate studies. In tandem, I also have students pursue individual research projects to ensure that they learn to synthesize the current state of research and understand the effort needed to become subject-matter experts.

Self-assessment¹: Prior to joining as faculty at BYU, my teaching opportunities were mostly restricted to adjunct instruction, during which time I received minimal feedback. As such, I will constrain this teaching self-assessment to experiences at BYU.

As reflected in the BYU student evaluations, I am an attentive and understanding professor, who provides ample one-on-one time to answer questions and to help students succeed.

¹ – I have a pronounced inclination towards very critical – even caustic – self-assessment. I have attempted to ameliorate some of my inherent negativity here and elsewhere, albeit with limited success.

While being an enthusiastic lecturer, I recognize that I am prone to less interactive forms of teaching. Despite my best efforts, lessons tend to contain too much material and spend too much time in the minutia. Certainly in the upper-level courses, I have at times fallen into the fallacy that I need to regurgitate everything I know to justify my appointment as BYU faculty.

Student ratings have been generally positive. Albeit with a small sample size of only three courses (two of which were PHSCS 428), the student ratings have been slightly below the historical averages for these courses but within (or very close to) the Departmental averages for these course levels. Not surprisingly, comments have ranged from constructive to acerbic. Of the constructive comments, a good number of students have suggested that the lectures and other assessment tools (esp. homework and tests) are not ideally structured and seem disorganized. Some students in lower-level classes also have claimed the material is overly difficult². The following goals and plans were selected to help: (1) provide instruction on the ways in which students develop critical reasoning skills; and (2) develop tools to better engaged students and encourage participation.

Goals and Action Items:

1. Broaden my understanding of teaching styles and instruction modes, as well as faculty resources at BYU.
 - (a) Observe lower-level astronomy courses for pacing and learning activities.
 - (b) Continue attending the Center for Teaching & Learning (CTL) Faculty Development Series.
 - (c) In the summer of 2023, attend the Physics & Astronomy New Faculty Workshop (NFW) on evidence-based teaching methods that is put on jointly by the AAPT, the AAS, and the APT.
2. Build on BYU's New Faculty Series (NFS) workshop on by independent study.
 - (a) Read at least two books on evidence-based teaching strategies prior to advancement to CFS candidacy.
3. Finalize a teaching philosophy and methodology.
 - (a) Seek input from the CTL in Fall of 2022 on specific (but representative) learning activities and assignments for an upcoming PHSCS 127 teaching assignment
 - (b) Obtain formative assessments of a lower-level astronomy course to get feedback on the efficacy of the active learning activities.
 - (c) Redesign course activities (esp. in upper-level courses) to more fully make the transition from traditional lecture-style teaching to more active classroom instruction.

Resources Needed: Other astronomy faculty have been very willing to share course materials to help me understand expectations. I have also used this material to develop assessment material and active learning to gauge student comprehension. In addition, more formal teacher training (e.g., through the NFS at BYU or the NFW put on by AAPT) would help to make the transition from traditional to active learning.

MENTORING.....

Philosophy: I view the role of a mentor to be to introduce a protégé to the opportunities and tools needed for success in a field, all the while developing in the protégé both intuition

² – I believe this is more likely a composite problem of (1) students in the pandemic era being underprepared for the start of college courses and (2) students having unreasonable course expectations, which I believe stem primarily from the disparate approaches and levels of rigor adopted by different professors.

and a self-sufficiency from the mentor. Such mentor-protégé relationships may be either formal or informal, but each successful relationship is crafted to the needs of the protégé.

I approach student mentoring opportunities by assessing the interests, skills, and goals of each student³. Not all students are well-suited for graduate-level research; however, a student's potential is neither static nor easily quantifiable based on preliminary meetings. Before assigning longer or more involved projects, I prepare short and exploratory tasks for new undergraduate members to introduce my research area, which are designed to result in clear (and astronomically significant) results. Future projects are based on refinements in interests and an assessment of gained (or desired) skills.

Self-assessment: Student comments regarding my mentoring have been almost uniformly positive⁴. I avoid belittling ideas that are not feasible, and I make a conscious effort to not criticize URA effort even if the work products are not usable. I praise initiative and then set about (re-)explaining concepts and redirecting efforts.

As a mentor, I am always willing to help guide students. In addition to spending significant one-on-one time reviewing progress and answering questions, I have found that an explicitly-stated “open-door” policy is important for many new researchers to develop crucial critical thinking skills and avoid wasting time. Unfortunately, for a few students the regular feedback can be a crutch. I have not effectively conveyed different policies based on the behaviors of different students. At present, I am mentoring six undergraduate students and one recent graduate from BYU, along with one graduate student, and this open-door approach at times results in a huge time sink, reducing the available time to focus on my other responsibilities.

Goals and Action Items:

1. Set more clear limits on mentoring commitments.
 - (a) Hold to a cap of 8-9 URAs at a time and up to two concurrent graduate students.
 - (b) Refine the open-door policy to still allow for contact when needed but encourage most help to be given through email or in scheduled meetings.
2. More carefully craft mentoring experiences.
 - (a) Group any future students into cohorts, working on the same (or complementary) projects. This will create a support structure in which I will encourage instruction and advice by members of the cohort.
 - (b) In the beginning of each project, more explicitly lay out a plan leading from data and training through publication.
 - (c) Better plan and implement URA projects to work within my existing research plan; these projects should complement my ongoing research without preventing progress on my research obligations.
3. Give future graduate students more responsibility as a resource for certain cohort(s) of URAs.

Resources Needed: At present, no additional resources are needed. Existing College URA funding and Departmental support for undergraduates to travel and present at

3 – I have found a written document introducing research group expectations, together with several open-ended questions, helps to set boundaries while forcing students to inspect their motivations and define their aspirations. A written document (of two or three pages) also lends additional *gravitas* to the research experience from the beginning, with the document serving as an implicit contract.

4 – With the caveat that these comments were made face-to-face.

conferences are sufficient.

SCHOLARSHIP

Self-assessment: Overall, the research that I pursue and that I undertake with my students is considered to be novel, publishable, and, at times, even press-worthy. The techniques I employ and teach to my students are consistent with the best practices in the field. Historically, the pace of publication has not been rapid, in large part due to difficulties with suppressing my own perfectionism and tying off research projects.

As I strive for balance between competing responsibilities, other considerations especially those of teaching and mentoring tend to displace time earmarked for my own research and writing. In the past, I had made up for this by pursuing scholarship in the late evenings, with varied success. Recent changes to our family routine have now upended this insomnolent schedule. At present, I am working to schedule blocks of time for writing at least three times per week to ensure at least this part of scholarship is being regularly pursued. Results have been positive, but committing to a writing schedule has been challenging.

At the time of my application in January 2020 for the advertised faculty position, my publication history was not incredibly deep. Much of the collaborative efforts during graduate school and as a postdoctoral researcher had remained unpublished until recently. At present, I am a part of five collaborations, three of which are well into the analysis phase and are beginning a multi-year phase of active publication. These will continue to produce a regular stream (totalling $\sim 3.5 \text{ year}^{-1}$) of co-I publications without requiring additional significant expenditures of time, effort, or resources.

For the past 1.5 years, much of the remaining time spent on scholarship has focused on mentoring students in preparation for publication in tiers 1 and 2 journals. At present, four student-led projects are being drafted into manuscripts. I anticipate that two of these will be submitted in tier 1 journals by the end of 2022.

Resources Needed: Publication and computational costs were included in the start-up funding and continue to be sufficient for my needs. BYU's Office of Research Computing provides HPC to support this research without the need for additional resources or funding.

Goals and Action Items:

1. Create more concrete research plans.
 - (a) Consistently schedule writing/research time at the beginning of each week.
 - (b) Restrict the open-door policy during scheduled writing windows.
2. Regularly publish my own work, with at least one PI publication per year.
 - (a) Finish and submit two PI manuscripts (one with significant contributions from an REU student) by the end of 2022 or early 2023.
 - (b) Submit an additional two student-led papers in the same time frame.
 - (c) Develop a research calendar that includes grant deadlines.
3. Prioritize fruitful collaborations and high-impact studies.
 - (a) Invest heavily in the TAMU and AGN STORM 2 collaborations.
 - (b) Focus on a quick paper outlining the extension of reverberation mapping programs to near-IR spectral observations.
4. Regularly submit grant proposals, esp. over the next year.
 - (a) Submit 1-2 grant proposals to fully fund a PhD student (with the potential for

another being funded for 1 2 years) from LEAPS-MPS (due Jan 2023) and ALMA SOS (due May 2023) calls for proposals.

- (b) Submit 1 2 grant proposals to support ongoing URA projects from the UNSGC Faculty Seed Funding (due April 2023).

CITIZENSHIP.....

Self-assessment: I am engaged in a limited number of citizenship roles, including serving as (1) the faculty advisor for the BYU Astronomical Society; (2) a member of the Physics & Astronomy Undergraduate Advisement committee; and (3) one of the ngVLA Science Working Group 3 members. Currently, I am not seeking any additional assignments and will not volunteer to fill other roles for the foreseeable future.

In addition to these formal assignments, I am also somewhat self-appointed to work to improve the ESC 4th floor resources, including updating displays and planning and executing both functional and aesthetic changes to the astronomy library. I keep the library calendar and will continue to print monthly calendars to ensure communication regarding this joint meeting space.

Resources Needed: The only support I will need is occasional Departmental funding for functional and aesthetic improvements to places like the astronomy library.

Goals and Action Items:

1. Finish the envisioned updates to the ESC 4th floor.
 - (a) Seek regular updates from Eric Hintz about the Physical Facilities plans/progress on the astronomy library upgrades.
 - (b) Seek Departmental funding for new furniture for the library.
 - (c) Finish new display pictures for the 4th floor hallway.
2. Take a more active role in astronomy faculty leadership.
 - (a) Schedule ~monthly faculty meetings; make and circulate agenda items and keep detailed notes during the discussions.
 - (b) Support astronomy group meetings, including giving presentations on student-led interests or initiatives.
3. Promote/support meaningful Astronomical Society experiences.
 - (a) With the new club president, develop a more clear outreach goal that may dovetail with PER/AER efforts by other faculty members (e.g., Merrell, Bennion).
 - (b) Encourage new potential leadership from current club membership.
 - (c) Encourage Physics & Astronomy majors and graduate students to become involved in club activities.