Introduction

It is my pleasure to present a summary of my teaching, scholarship, and service in pursuit of promotion and tenure. Over the past five year at Rollins, I have greatly enjoyed a smaller, more intimate environment after years teaching large (60-100 seat) lecture-based courses and doing minimal research. I feel I have taken advantage of Rollins' smaller size to try innovative pedagogical techniques and do interesting work with student researchers in a collaborative environment and have met or exceeded my department's standards for tenure and promotion.

Teaching

I sum up my teaching by saying, "I like to give students an opportunity to impress me." This means that I have high expectations for students in my courses and my courses are challenging. I try to communicate these expectations to students clearly and often, ensuring they understand the commitment required of them. In return, I scaffold my courses so all students can succeed and experience the sense of accomplishment that comes with mastering a challenging task.

My high standards help students discover their capabilities. Failing to challenge students implicitly tells them that I do not think they can learn complex material. Showing them that they can do high-quality work, pick apart difficult topics until they understand them, and stick with a project until it works are invaluable life skills and go far beyond my classroom.

Designing Challenging Courses

Students routinely report that my courses are challenging. The average GPAs are often lower than average, and the students report a high time commitment to the courses. Throughout my CIEs, there are comments such as:

- "the workload was difficult and helped us learn about the topic from theoretical and practical perspectives"
- "Homework aided in the [learning] process but it was difficult to get anything over a 90."
- "Homework are challenging but forces us to implement concepts we learned in class."

I am clear with students that an A in my courses requires exceptional work. Students who take advantage of the materials, come to office hours, ask questions in class, and work on the assignments diligently can succeed in my courses. I am happy to help engaged students in any way I can including recording videos on specific problem areas, holding office hours at a variety of times, and preparing targeted in-class activities. I also strongly believe in helping students learn from their mistakes and offer detailed feedback on programming projects and quiz/test answer keys with common mistakes outlined.

Fostering Student Resilience

Students must also feel that sense of accomplishment in learning the material and mastering difficult assignments. The following two comments show the student perception of the learning environment I hope to create in my courses.

- "Tough, but FAIR professor. Although I definitively struggled with various assignments and projects, the expected rigor was appropriate. I felt a rare sense of fulfillment I haven't felt in a while in most of my other classes."
- "I got a lot out of each and every [assignment], and can genuinely say that I am proud of what I have accomplished in this class."

I am continually impressed at how willing my students are to attempt things which intimidate them. I celebrate with them at the end of tough semesters and try to build celebrations of hard work into each course to balance my courses and keep "challenging" from becoming "overwhelming." Examples of this are the end-of-semester "Capstone Showcase" in our Capstone course (CMS484) and "Student's Choice Winners" in Creative Computing (RCC) or Computational Photography (CMS495).

Transitioning to Scrumage

At the urging of a colleague at Elon University, Dr. Shannon Duvall, I adopted Scrumage (Scrum for AGile Education) in many of my 300- and 400-level courses, jumpstarting the process after three years at Rollins with an Endeavor Center course re-design workshop in May 2019. Scrumage is a learner-centered course-organization methodology based on Scrum, a project management framework widely used in the software industry. Many software engineering classes teach traditional Scrum for project management. Scrumage, however, is a course management framework that emphasizes rapid feedback, adaptation, and student ownership of the learning process. Adapting courses to Scrumage was a significant pedagogical shift for me, but one which leverages Rollins' strengths: small classes and flexibility.

This pedagogical approach aligns well with my goal to create a course which shows that I trust the students to do hard things. A Scrumage course consists of a series of two-week modules called sprints. Each sprint has a set of target learning goals and a list of required deliverables based on those goals, such as completed problem sets or programming projects. At the beginning of every sprint, the students receive the list of goals, deliverable assignments, and an instructor-curated list of relevant resources (e.g., textbook readings, articles, videos). Within a sprint, students are broadly free to make their own decisions regarding what resources they will use, who they work with, and how to produce the required deliverables. Thus, although the instructor is responsible for the overall goals, assessments, and content of the sprint, students are required to take ownership of their learning and make critical decisions about how to best master the sprint's material before an individual end-of-sprint quiz. Teams and individuals also reflect on their work over the past sprint and identify both successes and opportunities for improvement. Thus, Scrumage asks students to continually evaluate their own learning processes, which promotes "learning how to learn" and the development of related metacognitive attributes. I have transitioned multiple classes to the Scrumage format including MAT/CMS 310 (Theory of Computation), CMS 330 (Operating Systems), and CMS 484 (Capstone), and my approach to Scrumage and a single sprint can be seen in the submitted *CMS 330 – Operating Systems* materials.

I was skeptical of the effectiveness of Scrumage and thought I would have to dampen my expectations. I was also skeptical of my student's abilities to manage their time at such a high level. However, I realized that I needed to move away from lecture-based courses and prepare our students for an ever-changing career in computer science. The approach has been successful beyond my wildest expectations. I was shocked at how my students responded to the freedom I gave them. They viewed the responsibility as

trust and took that trust seriously. The progression of CMS 330 over 3 Springs 2019-2021 is shown in my CIEs. The first course, Spring 2019, shows student frustration with the volume of material, confusing textbook, and overwhelming lectures. In Spring 2021 (a completely Scrumage-based course), the students covered more material with few in-class lectures from me. Their quizzes and assignments demonstrated similar competence to the old format of the class. The CIEs for Spring21 show that the students enjoyed the format and considered the sprint format to be highly successful. The format challenges me because I must work 3-4 weeks ahead of the students and have each sprint finished and ready to go. It forces to me to be organized and deliberate about material and assignments.

Future Goals

In the future, I am looking forward to teaching more courses, such as Human-Computer Interaction (CMS354), with Scrumage and experimenting with ways to incorporate elements of Scrumage into beginner and intermediate courses.

Research and Scholarship

My department's tenure requirements include two peer-reviewed, published articles or conference proceedings and an extended pattern of scholarly activity. I have exceeded this requirement with four double-blind, peer-reviewed articles and many other artifacts demonstrating a pattern of scholarly engagement with the computer science community.

 While at Rollins, I have focused on interdisciplinary, collaborative research with other faculty, students, and institutions. Much of my research work leverages on my passions of human-computer interaction (how people use computers and how computers can be more usable for humans) and CS education. I also focus on pedagogical research showing how CS can incorporate aspects of the humanities. I see my research as another venue for teaching and try to work with and mentor students in the research process, including supervising 7 honor's theses and serving on an additional 7 thesis committees. Three grants, two with NASA-JPL and one from Google, also focused on student activities. The NASA-JPL grants funded two top CMS students at internships in the summers of 2019 and 2020.

Incorporating Humanities into CS

As an example of incorporating writing into CS courses, my work on reflective writing [J2 on my CV] was published in the Journal of Computing in Colleges in Oct. 2019. This double-blind, peer-reviewed paper focused on the benefits of giving students structured writing assignments which require them to grapple with literary works in computer science. For example, the students read Nancy's Leveson's case study on the Therac-25 (a radiation treatment machine which killed multiple people due to a software error) and reflect on the life-and-death role that software often plays. Forcing CS students to grapple with the ambiguities and messiness of history and literature within their discipline is important, and my paper gives guidance on how faculty can give students these opportunities.

My work on using science fiction in computer science courses to help teach ethics is the result of a long-standing collaboration, as is the norm in CS. Dr. Rebecca Bates (University of Minnesota-Mankato) and I have worked together with others since 2012 on a variety of panels, special sessions, and a full conference paper and presentation in 2020. Refereed CS conferences typically require the submission of a complete paper, which then undergoes double-blind peer review before being accepted for publication in the proceedings. Our ASEE paper [P1] made the case that disciplinary experts should take

on the challenge of teaching ethics in disciplinary courses and showcased how to use science fiction short stories to present ethical dilemmas in short, course-period sized exercises.

Human-Computer Interaction Research and Student Collaboration

Another significant aspect of my research has been applying my HCI skills to interdisciplinary areas. Two students, Cyrus Bonyadi and Rene Borr, had significant experience in the theatre program at Rollins. Both approached me about interesting and novel areas which they felt were ripe for technological interventions. While the areas of application were new and interesting, writing software is not in and of itself research in the computer science community. While they wrote the software as theatre experts, I provided the evaluation experience which allowed them to conduct user-studies and rigorously evaluate their software. Bonyadi's project [J3] showed how virtual reality could be used by directors, producers, and actors to envision the physical aspects of a set before it was constructed. Borr's work [J1] showed how software could be used to shorten the laborious process of producing line notes which provide feedback to actors during rehearsals. This project has continued but has been sidelined by COVID for the past year due to the difficulty of conducting face-to-face user studies.

These projects showcase my teaching philosophy as applied to student research: have high expectations and encourage the students to do excellent work. Both students had a desire to attend graduate school; thus, I viewed it as my job to ensure they understood a graduate-level research process. Both students were expected to work independently and take ownership of the projects. They were involved in every stage of the projects: writing software, filing the IRBs, drafting the paper submissions, and giving conference presentations about their work. During the year they work with me, I am responsible for teaching them about the research process, mentoring them as they practice their new skills, and correcting work to ensure it meets disciplinary standards. While a member of my mid-course CEC committee differed in the assessment of how student co-authored work should be viewed, I simply view these projects as research collaborations with an increased teaching element.

Future Work

As mentioned in the teaching section, Scrumage was a marked pedagogical shift for me. I wanted to evaluate it in a rigorous way to discuss implications for the broader CS community. With IRB approval, Dr. Dan Myers and I have collected a significant amount of data across multiple Scrumage classes including pre- and post-course learning inventories, retrospectives, and student-generated management artifacts. This data is ready to be analyzed.

After tenure, I am also hoping to return to several other projects which have been sidelined by COVID:

- Dr. Jenny Queen and I were working on a project about student learning styles before COVID hit. We were ready to deploy software and begin user studies to collect data.
- My work on micro-volunteering [OC4] and a student thesis on this topic were very productive, and I am ready to obtain IRB clearance begin collecting data on a pilot an activity in the fall.
- The project on theater line notes is ready to transition to a web-based platform.

Service

Throughout the past five years, I have made it a priority to take on service commitments which are very applied and have concrete outcomes. I have met and exceeded the departmental standards for tenure and promotion through the combination of college, departmental, and disciplinary service.

College Service

I have served on the Rollins' Institutional Review Board (IRB) since January 2017. This committee oversees human-subjects research at Rollins and evaluates a variety of proposals in accordance with federal research guidelines. These proposals range from undergraduate thesis work to multi-institution COVID-19 data collection and testing studies. The work and deadlines are challenging, but I appreciate the direct impact the work has on Rollins. My background in Human-Computer Interaction makes me uniquely positioned to comment on both the human and the technological aspects of research Serving on this committee for over four years has given me unique opportunities to contribute, and I have authored multiple documents designed to ensure that researchers who are new to IRB protocols submit the required documents containing the required information, saving both the researchers and the committee time.

Since my mid-course evaluation, I served on the Curriculum Committee (Science Division representative) from 2019-2021. After COVID-19 hit in March 2020, the committee was in uncharted waters and the work was especially challenging. The committee met continuously over the summer of 2020 and had lengthy discussions about calendar reorganization, attendance policies in virtual teaching, and the suspension of the BCMP and PEA requirements. While I had always known that communicating Science Division concerns to the committee was a key role I would play, during the slew of new pandemic policies, I found the communication to my science colleagues at our twice-a-semester Science Division meetings to be crucial.

I also chose to serve on the Academic Appeals subcommittee for 2 years, specifically requesting to continue that subcommittee in my 2nd year. This continuation gave me a chance to deeply understand academic policy and apply a multitude of considerations when determining how and if an exception should be made to published policy. This subcommittee also saw an outsized impact due to the number of appeals which were filed during COVID affected semesters.

Departmental Service

In many ways, my five years in the department have been marked by substantial and sometime chaotic change. We have made tough decisions to close the CMS Holt program but have seen explosive growth in our CLA program. We have weathered two retirements and hired three tenure-track faculty (though we lost two of them after less than a year) and two visiting faculty. We also overhauled our CLA curriculum due to these changes and allow our program to run as lean as possible. I have been continuously engaged in departmental service as we have navigated these upheavals. I have served on all five search committees for CMS faculty. I also spearheaded the teach-out plan when we ended the Holt CMS program in 2018-19. I met with all remaining Holt students 1-2 times per semester to ensure they were on-track and advise them given our ever-changing course offerings as faculty retired or left.

One of my favorite service commitments is advising our students. I routinely advise 15+ students a semester in addition to unofficial Holt student advising when that program was active. (Holt students

have professional advisors, but also need department-level advising given the small program size and limited course offerings.) I view advising as one of the most crucial roles I play and have been recognized for my advising work.

I am also the faculty sponsor for our Association of Computing Machinery (ACM) student club. This club has traditionally been very strong and provides a welcoming community for new CMS students. Leadership and membership have decreased during COVID, and a key goal for next year is to try to return the club to its former self-sufficient strength.

Disciplinary Service

My service to the discipline of computer science has been through my involvement with ACM conferences which are a crucial venue for disseminating research results. I participate primarily in the Special Interest Group on Computer Science Education (SIGCSE) conference, a yearly conference of 2000-3000 attendees. During my first year at Rollins, I served on the conference committee. This is a two-year commitment, which began while I was at Emory University. In my role, I oversaw Kids Camp, the conference-sponsored childcare. I am passionate about childcare at conferences as a mechanism to ensure diversity and inclusion for parents who must bring their children with them to conferences to present and publish their research. I also routinely serve as a paper, poster, and panel reviewer for SIGCSE and serve as a session chair when the opportunity arises. I view all these activities as ways to contribute to a conference which focusses on education and ensures that pedagogy remains important to the discipline of computer science.

Future Service Goals

After tenure, I am likely to continue the same distribution of service. I anticipate serving as CMS chair for several years; I am serving as Interim Chair while Dr. Dan Myers is on sabbatical as we have no other post-tenure CMS faculty. I would also like to renew my involvement on the conference committee of SIGCSE which I have not had the opportunity to do since 2016.

Conclusion

In conclusion, my work from the past five years has been challenging and fulfilling. I have met and exceeded the tenure requirements for the Math and CS Department. I am excited about the future and the continued possibilities at Rollins.