

# Raymond Buse - Teaching Statement

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*"Thought flows in terms of stories - stories about events, stories about people, and stories about intentions and achievements. The best teachers are the best story tellers. We learn in the form of stories." -- Frank Smith*

## Teaching Philosophy

*"Ray's lecture was very engaging and easy to understand." \**

When I lecture, I tell a story. First, I introduce a problem (e.g., my bank has lost my deposit, the Ariane V rocket self-destructs 37 seconds after launch). The problem exposes a technical obstacle (e.g., race conditions undetected, exceptions unhandled). Next, I discuss previous approaches (e.g., traditional testing) and explain how their limitations have led to new solutions (e.g., model checking). The story describes not only *WHAT* the solution is, but *WHY* it came about, *WHY* it's useful, and *HOW* it's limited. I think it's important to show students that computer science, from systems to theory, is deeply **creative and scientific**.

I have mentored students, served as a teaching assistant for several courses, and given at least seven guest lectures in undergraduate and graduate classes. While my research interests lie primarily in software engineering, I have broad interests in computer science and I believe **I can be an effective educator in many courses** including introductory courses, programming languages, algorithms, theory, AI, and many systems courses including operating systems and distributed systems.

## Motivating Students

*"Ray has very good teaching skills and his slides keep me interested." \**

**Stories connect ideas** and help maintain interest; however, one must be careful since not all students are motivated by the same things. I once introduced subtyping in part by discussing with students whether Batman should be considered a "superhero" despite lacking supernatural abilities (consensus opinion is that Batman is only a "caped crusader"). Later, I made a similar point noting that many different instant messaging clients may implement the same abstract interface, yet there are sub-classes with additional features. The use of many different examples is a common thread in my lectures.

Furthermore, I find that students are often best motivated by practical concerns. Today we are surrounded by computer systems of many types and I often find that smart phones, social networks, and other ubiquitous and emerging technologies can be effective instruction aides. As a professor I would design projects and other opportunities for students make use of the popular technologies of the day (e.g., developing mobile applications, integrating with social networks, using new APIs).

## Incorporating Research

*"Ray offered real-world contexts demonstrating where certain [Machine Learning] techniques are appropriate." \**

I believe there are strong benefits to discussing recent research results in the classroom, even at the introductory level. **I strive to make my own work on code readability and automated documentation highly accessible**. This work has already been featured in graduate and undergraduate courses here at UVA.

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\* Anonymous student feedback

For example, I lectured in a 200-level class that called for the introduction of *data-structure invariants*, perhaps a notoriously dry topic. So to demonstrate the power of invariants, I demoed some recent work on automatic verification of invariant annotations.<sup>†</sup> I showed students how next-generation tools can interpret invariants and pre/post-conditions in order to verify important aspects of program behavior. I believe that in addition to the appeal of new technology, exposure to research is useful for emphasizing the **creative aspect of computer science** and dispelling some negative perceptions.

### **Promoting and Studying Diversity**

*"This is an important paper. Too many times in gender issues, we accept anecdotal information – especially if it is persuasive and/or prevalent – as the product of rigorous research"* ‡

I hold the opinion that gender and racial diversity are beneficial in the computing field; diversity of individual backgrounds helps generate varied and **creative ideas**. For over four years I have served as both a member of the diversity committee (a standing faculty committee devoted to diversity concerns) and officer of the UVa ACM Women in Computing (ACM-W). In that capacity I've worked to institute programs aimed to build community and encourage underrepresented groups to study computer science. In 2009, I was honored by my department with the **Graduate Award for Service** for my contributions related to diversity.

During my graduate tenure, I designed and carried out many diversity-related events. Five *Fireside Chats*, for example, gave students the opportunity to meet and ask questions of professors in an informal setting (typical attendance is about 50). In 2010, I arranged for a visit from recent Turing Award winner Barbara Liskov. Liskov's lecture was attended by over 500 students and faculty. We believe these attendance numbers are excellent. However, it is my position that we must determine if they have translated into tangible results.

Diversity is an excellent **opportunity for scientific exploration**. As with any experiment, it is important to carefully measure treatment effectiveness. To that end, I have helped to design and implement a series of surveys useful for tracking key trends in attitudes related to diversity. To date, I've gathered survey data from over 1,000 UVa undergraduates. Our long term goal is to quantify the effectiveness of our diversity programs in a statistically significant manner. To that end, we've already made progress: I am the lead author on a paper entitled *Female Students Outperform Their Expectations: Perception vs. Reality in Introductory Classes* which is currently under submission to ACM Transactions on Computing Education. In the future, I would be interested in joining an existing diversity effort, or beginning my own.

### **Conclusion**

*"Ray's lecture was well done ... it really helped me understand exactly what these techniques are and how they work."* \*

My story as an educator is only beginning. When I've had opportunities to teach, I have had success designing engaging lessons that emphasize **creativity and scientific exploration**. I remain open to new ideas and strategies. I hope you give me the opportunity to teach your students.

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† <http://arrestedcomputing.com/lectures>

‡ Feedback from an anonymous conference reviewer