# TEACHING STATEMENT

Christopher M. Collins

By learning you will teach; by teaching you will learn. (Latin proverb)

Good teaching makes students interested in finding out more, encourages students to think critically and independently, engages classmates with each other and the professor, makes everyone welcome, offers all students opportunities to learn, and makes connections between courses, research, and the "real world". Good teaching engages students in constant feedback and adapts to their needs. I consider myself a lifelong learner, so I believe that in each course I teach, there are opportunities for me to learn — about teaching, about myself, and about new research opportunities. I teach to these ideals: exciting students about learning and helping them gain the tools to question, to draw connections between the curriculum and the real world, and to learn independently. One of the highlights of my graduate studies has been the opportunity to teach and act as a research mentor. The opportunity to continue these activities is one of my primary motivations for seeking a faculty position.

My own experience as an undergraduate student left me often wondering what my professors did when they were not teaching. I wondered what went on in computer science outside of the classroom. Effective learning occurs when students are able to place what they have learned in the context of their other courses, the prominent research in the area, and how the subject relates to the real world of business, research, community, and culture. In each classroom, the students' level and course goals will dictate the degree to which this is possible. Early undergraduate courses require a more lecture-based style whereas graduate courses can and should include in-class discussions that draw more attention to the real world of research. However, even in undergraduate classes, some time should be taken to place the course material in context. I have found it effective to relate a brief anecdote to start each class — a story about how the material helps me do my research or a case study on software or interface design failure or success (failure stories seem to get more attention!). This works for 20 or 200 students.

Teaching style must be varied to engage different learning styles and to maintain attention and interest. I have used group work, peer code-review exercises, online discussions, in-class design exercises, and student presentations to avoid overly monotonous lectures. The level of independent and critical thought I expect also grows with student experience: early undergraduates may only get as far as learning the facts; graduate students must synthesize course material, demonstrating critical thought and deeper understanding.

Threaded discussions linked to video in the BackTalk system developed for evaluating student presentations.

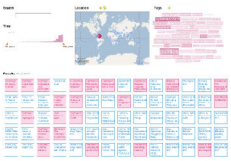
I have been actively developing my teaching skills, attending the *Teaching Assistant Training Program* at University of Toronto (2004–2005) and the *University Teaching Certificate* at University of Calgary (2007–2008). My practical experience includes assisting in course development, guest lecturing, marking assignments and exams, conducting tutorials, deploying innovative classroom technology, and mentoring senior undergraduates and Master's students. My teaching assistant reviews have consistently been at the 95$^{th}$ percentile or above when compared to hundreds of others.

From logic and circuit design to human-computer interaction, I have been a TA in a total of seven sections in five unique courses covering a wide range of topics. I have also guest-lectured for graduate level courses in information visualization. The most unique course was *Communication Skills for Computer Scientists*, an

innovative speaking and writing class for which the instructor specifically invited me to be the TA. In this course, I participated in the development and deployment of new in-class technology to record and have threaded discussions about student presentations (published as [C. 2]). Peer feedback fostered a sense of community and mutual encouragement amongst the students. By the end of the semester, we had several students approach us and say they knew the course would pay off for them many times over.

Software and physical prototypes for RoutePlanner, a student project for planning and motivating exercise.

One of my greatest teaching successes was mentoring several particularly keen groups of *Design of Interactive Computational Media* students to develop their term projects into entries at the *ACM CHI Student Design Competition*. The course is based on a term-long group project, in which group members of varying skills develop a media design project from a spark of inspiration to an evaluated functional prototype. Despite occasional challenges of group imbalance and the need for facilitation, this experience taught me that project-based courses help students to develop interpersonal skills, learn technical skills from their peers, and integrate course material from several areas. The course design achieved progress toward an institutional goal of involving students in service learning and community engagement: projects were based on a real-world problem, such as technologies to encourage physical fitness, and students were required to engage stakeholders at each stage. I helped arrange several innovative events for this course. Early in the semester, I worked with the *Ontario Science Center's* "Citizen Lab" project to arrange for my students to attend the museum and conduct both interviews and focus groups to refine the requirements upon which their later designs were based. Later in the term, we ran an in-class contest, judged by guest design experts from industry, to choose finalists. The prospect of winning a contest and potentially being "discovered" by industry was a useful motivator. In the end, three groups were so excited about the assignment that they volunteered to collaborate beyond the end of the semester to expand and submit their projects to the international design competition. One group was invited to attend the conference as finalists and publish their project [SP.1]. I attended with them, and it was rewarding to witness their eyes opening to the possibilities of computer science and interaction design research.



Weighted brushing in VisGets.

I have also had the opportunity to mentor (in conjunction with a professor) senior undergraduate and Master's students. As the more experienced member of a research team, a mentor acts as a challenging motivator, a sounding board for brainstorming, and an advisor on project planning and evaluation. There is a balance between working side-by-side as colleagues and serving as an advisor to help students to avoid common research pitfalls and to overcome them when they occur. For example, I helped Master's student Marian Dörk frame his research problems in terms of existing work by guiding his reading list. Later in his project, I challenged him to move his VisGets project a step beyond the original concept by suggesting the idea of weighted brushing, then helped him to describe the results in a manner appropriate for publication. The project was successfully published in InfoVis 2008 [J.4] and Marian is now studying for his PhD.

I have also been actively involved in furthering higher education at the University of Toronto and in the province of Ontario through participation in department curriculum reviews, my membership on the University Affairs Board of the Governing Council, the School of Graduate Studies Council, and as a delegate to the Ontario Review of Post-Secondary Education.

## POTENTIAL NEW COURSES

I am, of course, prepared to take on courses in the fundamentals of computer science and media design. Additionally, here, in brief, are some ideas for new courses I would be excited to offer.

### INTRODUCTION TO INFORMATION VISUALIZATION

This undergraduate-level introductory course will introduce information visualization from a user-centered perspective. Through hands-on design activities, lecture-based coverage of the necessary theory in cognitive science, computer graphics, algorithmic layouts, 2D and 3D issues, interaction, and design critiques of famous and student-created visualizations, we will answer questions such as: How do humans perceive visual information? What visual attributes are best to convey different types of information? How do dynamic aspects, such as interaction and animation enhance or detract from the visualization experience?

### INTERACTING WITH LANGUAGE

A senior undergraduate course exploring how computers facilitate human communication through interfaces customized for language. Topics include user-centered design with a focus on linguistic interfaces, basics of speech recognition, dialogue systems, text-to-speech, interfaces for information retrieval, exploration of computer-mediated communication tools, emerging devices for communication, systems to support for special needs (e.g. memory loss) and language learning, and visual interfaces for language. Student projects will focus on designing, prototyping, and evaluating interfaces for specific language-related data problems.

### INTRODUCTION TO COMPUTATIONAL LINGUISTICS

Undergraduate-level introduction to computational linguistics and natural language processing. Topics include basic linguistics, part-of-speech tagging, grammar design, chart parsing, machine translation, automatic summarization, topic detection, sentiment analysis, Markov models, Bayesian statistics, and basics of language understanding. Evaluated through programming assignments and a final exam, this course could be a good preparation for advanced study in computational linguistics.

### VISUALIZING LANGUAGE

A graduate-level course addressing specific challenges for linguistic visualization. Introduction to information visualization would be a pre-requisite. Topics include labelling, legibility, usability implications of data transformations, linguistic uncertainty, visualization for the Web and streaming data, linguistic data structures, visualization for language learning, and several lessons of current topics readings with student-lead discussion. Students would, in consultation with me, identify a research idea of suitable scope, and over the term develop it into an implemented prototype. Web-based projects and topics with potential community impact will be encouraged.

### SPECIAL TOPICS

These courses would be centered on reading and discussing seminal and current research papers, lead each week by a student and facilitated by me. Brainstorming discussions would identify research opportunities suggested by the readings. Possible topics include: *Visualization for Public Displays, Collaborative Information Visualization, Large scale social computing, Interaction Design for Information Visualization, Visualization for Emerging Display Technologies (large screens, tabletop displays, mobile devices), Corpus-based Natural Language Processing.*