TEACHING STATEMENT

MAURICIO SOUSA

I have worked with great students through mentorship and teaching, and I am excited to continue this as faculty. I believe that learning computer science can empower students to solve the challenging problems that matter most to them. With consolidated knowledge in computer science from lectures, group projects, and lab experimentation, students can apply their skills to improve and overcome challenges in the other knowledge domains of their future careers and lives. My formal education is in Software Engineering and Computer Science, and I have specialized in Human-Computer Interaction and 3D User Interfaces during my Master's and Doctorate studies. My background provides the tools to teach Human-Computer Interaction, Computer Graphics, and other related courses. My experience has led me to believe that impactful and inspiring teaching practices are grounded in these five primary pedagogic principles: *Inspire and motivate; Hands-on learning; Discussion and critical thinking; Allowing for creativity; and Learning with each other.*

Inspire and motivate – Keeping students motivated can be a challenge. From my experience, I found that students are more likely to be inspired by research topics when presented with real-world applications such as the production of science fiction movies. Another approach is actively exposing students to state-of-the-art research related to the curriculum when possible by introducing in the classroom the latest developments and scientific papers that might interest them. Additionally, inviting students to participate in user studies to experience new technologies is a way to keep them engaged.

Hands-on learning – The main hardship I endured at the initial stages of my undergrad was an almost singular reliance on theoretical materials in the curriculum. This lack of direct hands-on experience hindered my knowledge consolidation. Therefore, combining teaching styles from lectures to hands-on sessions can keep students focused and motivated.

Collaboration and Discussion– Rather than a unidirectional flow of information, I consider learning a collaborative activity achieved by a group of people with shared goals. I believe that students should have the space to develop their values and their way of thinking. Yet, collaboration with my peers was integral to my Ph.D. experience. Through the intensive discussions and sharing of ideas, I gained confidence that I could achieve my research goals. Therefore, I intend always to create an environment that fosters collaboration and discussion to benefit the group.

Allowing for creativity – Fostering individual creativity facilitates students' ability to see problems differently, develop new approaches, and enrich their learning experience. As a teacher, I want to challenge my students to use their imagination, diverse experiences, and world views to guide their projects and research. And giving them the freedom to develop new creative ideas to overcome their challenges and apply the knowledge they acquire.

Learning with each other – A strong reason for choosing academia is to have the opportunity to collaborate with students from different backgrounds, teach them the technical skills they need to succeed, and, most importantly, learn from them. Teaching is learning as it requires instructors to always stay up-to-date with the curriculum; it is also learning as it constantly demands instructors to reassess their assumptions and understanding of the students. Most materials are new to students, and they perceive them with fresh eyes. Students' progress and feedback are always essential in how the materials should be adjusted and iterated.

Teaching Experience

During my Ph.D., I had the privilege to be a teaching assistant for the Human-computer Interaction course. The course was at the undergraduate level, and I was entrusted with two classes of 30 students per week. The lab classes had two main components: 1) I started each class by summarizing and recapping the lecture materials taught the previous week, and 2) providing mentoring and support for the students' term projects. Students were required to apply interface design methodologies taught in lectures to real-world scenarios. We employed an iterative approach for developing a user interface where students were required to perform design requirement analysis, prototyping, and several user interface evaluations. I found that providing a summary of the main concepts right before students put them into practice helped with knowledge retention and skill development. And with my guidance and feedback, groups of students were able to create impressive interactive prototypes of high quality.

Mentoring Experience

As a Ph.D. student, I mentored three master's students. As a postdoctoral fellow at the DGP lab, I supervised five undergrad researchers, one research assistant, and three graduate students. I am also co-supervising a Ph.D. student. Mentoring students is what I do best and it brings me great joy. My approach has always been combining hands-on advising and allowing students to develop and explore their ideas. I prefer to establish an open culture of communication and collaboration. And I frequently push for regular meetings to ensure that students feel they have support to succeed. At the same time, I try to keep students motivated and confident by offering them insightful descriptions of how I tackled similar technical challenges in the past. As a research assistant in four research projects in different domains (ex: Oil & Gas Industry, Architecture, Medical Imaging, and Surgery), I have an extensive background in prototype development and user evaluation design. I believe my diverse background has been instrumental in helping students overcome technical obstacles and expedite the tasks they had set up for their research. However, some projects can go beyond my expertise by encouraging students to follow their interests. I am always excited when this happens because it allows me to expand my knowledge and grow with them. There are a few examples I would like to share. My master's student, Carlos McGregor, was passionate about using psycho-physical indicators to predict when introductory computer science students struggled during programming exercises. His research was an excellent opportunity for us to learn more about cognitive theory and study the state-of-the-art taxonomies and strategies for CS1 education. Also, mentoring the Ph.D. students Jiannan Li and Karthik Mahadevan, made me gain a passion for Human-robot Interaction, electronics, and fabrication. These experiences expanded my interests and gave me the confidence to explore a broader range of approaches to solve the research problems I care about. My mentoring efforts have led to excellent outcomes, most students were able to publish their research in top-tier venues, and their success is something that fills me with pride.

Proposed Courses

My background in computer science, HCI, 3D User Interfaces, and Mixed Reality will allow me to contribute substantially to the department. In addition to contributing to introductory computer science and HCI courses, I would be glad to establish new courses related to 3D User Interfaces and mixed reality. Here are some possibilities:

3D User Interfaces and Mixed Reality – I propose an undergraduate course to introduce the history, design, prototyping, and evaluation of 3D User Interfaces in mixed-reality environments. Topics include: The foundations of 3D User Interfaces; what is virtual/augmented/mixed reality; input and output technologies; 3D interactions techniques (selection and manipulation, travel and wayfinding); Strategies for prototyping; Evaluating 3D user interfaces. This course would complement existing HCI courses by providing the tools for students to develop immersive and semi-immersive experiences. Students will work in groups and complete three project assignments to design, prototype, and evaluate a virtual environment and interactions in virtual reality and augmented reality.

Topics on Networked Virtual Environments – I also propose a graduate-level seminar on research topics on networked virtual environments focused on multi-user collaborative experiences. Topics include: Collaboration fundamentals; Face-to-face collaboration; Nonverbal communication; Virtual representations of people; Remote collaboration; Social awareness; Workspace awareness; Perception manipulation; Remote expert collaboration. The course will consist of both lectures and student-led paper presentations and discussions. The students will also conduct an independent project relating the course's topics to their research.

Topics on Interfaces for Creativity – Finally, I want to propose a graduate-level seminar course on research topics on advanced user interfaces for creativity framed in the application domains of drawing, painting, architecture, and engineering. Topics include: An overview of creativity interfaces in interactive surfaces, interactive spaces, and virtual environments; Input devices; Air sketching in mixed reality; 3D modeling in mixed reality; Human-AI co-creation. The course will also consist of lectures, student-led paper presentations, and discussions. The students will conduct an independent project relating the course's topics to their research.