Teaching Statement

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A valuable education meets the needs of each student based on a progression of their capabilities and growth while challenging them to advance to the next level. Entering students must develop the basic skills of their field, whereas undergraduate seniors should be able to contribute to interdisciplinary group projects. At the graduate level, guided research aids the student in identifying interesting projects while developing a thesis that demonstrates a deeper understanding of their field.

Interdisciplinary Education

A core education is essential to expose new students to fundamental principles and to the relevant histories of other fields. While developing the Game Design Initiative at Cornell University we found that interdisciplinary collaboration between engineers and artists greatly enhanced a students' ability to consider new ideas and methods. We developed a curriculum and technology (GameX) to promote incremental learning to enable students to solve increasingly harder problems matched with their abilities. Local media noted that GDIAC placed an "almost organic emphasis on learning through interdisciplinary project development" (Cornell Chronicle). While it is necessary to teach fundamental skills, interdisciplinary projects broaden student perspectives and expose them to issues of communication and cooperation that become relevant upon graduation.

Team-Based Learning

As the student progresses, skills improve, and they are able to work with others to accomplish goals. At Aalborg University in Copenhagen, Denmark in 2011, I had the opportunity to teach and instruct masters' students in graphics and animation with the Medialogy Program for digital media arts. The Danish education is renowned for its cooperative, team-based approach to education. For each course students choose their own team projects and are evaluated through a final project as a group rather than with individual testing. Whereas lecture materials present theory, team effort places an emphasis on learning practical techniques in the field. During my year with Medialogy at Aalborg University, I developed three course curricula and lecture materials in character animation, advanced rendering and digital scenography. Team-based learning helps to develop valuable skills in goal planning, problem solving and communication with peers. This approach emphasizes pedagogy to encourage faculty to constantly question their methods to improve student outcomes.

Practical Research

Several factors are vital to the success of graduate students working on guided research projects. One of the most important of these is the advisement and selection of interesting, unsolved problems based on literature reviews and the abilities of the student. While creating the Research-Oriented Social Environment (RoSE) at the University of California Santa Barbara, I mentored engineering graduate students in selecting projects in data visualization and database design while collaborating toward a common goal. For example, Ivana Andjelkovic (Masters student, UCSB), explored her strengths in dynamic data visualization while others examined the technology for efficient, parallel data queries, building on their own strengths while supporting her visualizations.

Another factor in successful graduate research, especially when working on grant-based projects with planned objectives, is to accept software reuse where applicable. Grant outcomes in computer graphics often combine a novel simulation result with high quality rendering, the latter of which can be solved with freely available third party tools. Thus identification of *specific* research goals is key to successful graduate student outcomes.

Theoretical Research

A research lab is built on a foundation of teamwork, collaboration, exciting challenges, and long term vision. Multi-year grants require integration of research and teaching where specific graduate projects move toward and contribute to a greater vision. The RoSE project succeeded where the goals of literary scholars guided engineering outcomes with novel solutions such that students in both fields could make valuable contributions. During the development of GVDB Sparse Volumes at NVIDIA, partner collaborations greatly increased when: 1) the project became open source to broaden its reach, 2) co-developers could participate by contributing to a stable core framework, and 3) other researchers could identify sub-components to pursue interesting unsolved problems. GVDB now has partners in multiple fields each requesting and contributing new pieces for the benefit of all involved.

Each graduate researcher should feel valued as a contributor to a grant, lab or team. A sense of belonging is not necessarily achieved through technological goals alone. For example, enforcing a specific framework may fail to account for the greater flexibility desired among peers. Strong team collaboration is more critical than conformity. I have been fortunate to observe in my mentors, and have adopt with my own students, the sense of value generated through balanced objectives, networking with other institutions, and a view of shared goals with clearly identified sub-tasks.

The most essential aspect of mentoring is a trend toward a unified vision which is encouraged primarily through careful guidance on research projects based on an implicit or explicit excitement for the future. In this future humanity has resolved some specific yet grander problems that bring us closer to a sustainable, cooperative, efficient, globally aware civilization. Teaching is based on conveying that promise implicitly to the student through interesting incremental tasks and goals.