Teaching Statement

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Teaching Philosophy

From an early age, students are provided with the necessary tools for exercising and flexing their academic muscles. Time is invested honing the individual to perform at his or her peak, and this performance is almost universally evaluated through the distribution of grades. For these reasons, academia can be quite competitive, and it is acknowledged that this competitive spirit can result in spectacular works. However, one must not forget the communal nature of what we endeavor both as teachers and as students. Learning is a shared experience, whether it is knowledge distributed through the literature, lessons transcended from a "sage on the stage," or ideas exchanged between colleagues working together in groups or one-on-one. Education empowers the individual to be intellectually equipped and competitive in the real world; but there is a growing need for collegiality within *teams* of individuals, especially as interdisciplinarity continues to spawn new professions and fields of study. There is absolutely a need for students to master their course material for their own purposes, but by duly promoting a sense of accountability to their peers (and ultimately to their colleagues, clients, society, etc.), student effort is incentivized beyond the point of simply earning a good grade. As each individual student is held to high standards of personal achievement in the classroom, teachers must also encourage contribution to and engagement within an active and thriving academic community.

Teaching Methods

Communal learning in my classroom starts with the establishment of rapport and trust between the students and I under the auspice that someday those students may eventually be colleagues. One of my primary methods for establishing rapport is through a continuous feedback/evaluation mechanism called "one-minute essays," a technique invented by University of California physics professor Charles Schwartz. As a teaching assistant for a graduate-level medical imaging physics course at Duke University, I asked students to take one minute at the end of each class period to recall, rehearse, reflect, remember, and record one or two sentences summarizing the lessons and conversations from the day. I often requested that students write about the most difficult topic of the day: The topic may have been one which was particularly challenging, poorly understood, or a topic which was inadequately covered by the instructor (see sample essays). I responded to student questions and concerns in blog form. The blog provided a forum where students freely conversed and participated by reading, discussing and developing the published topics which they inspired through their essays. As seen in this example, a series of posts and voluntary student work were submitted as students engaged in their own education while simultaneously contributing to the learning community. End-of-semester student evaluations of this process were positive indicating high student appeal, but the one-minute essays and blogs ultimately helped me as an instructor to quickly adapt my teaching to fit student learning needs as the course progressed.

The use of one-minute essays and blogs is an exciting and engaging way for students to use a familiar technological medium of exchange. I further incorporate the use of technology in my teaching through computer programming requirements. This is an especially useful method for learning lessons specific to medical physics. Students are invited to use a familiar programming language to write code which fortifies their internalization of difficult mathematical and scientific concepts. I have found that coding helps students to identify the weaknesses in their understanding of core concepts through the

identification, assessment, and correction of programming errors. For example, the implementation of MTF measurements, NPS calculations, and CT reconstruction algorithms all pose interesting and challenging problems which students solve through the creative design and organization of computer code. Programming is not only an interesting and challenging exercise for classroom purposes: It also serves as a useful and tangible research tool that students can use well after the class has ended. To further the importance of community-mindedness through computer programming, I offer a variety of my personal programming resources to students. They may access my personal library of computer programming resources made publicly available on the MATLAB File Exchange where much of the code relates directly to the topics in medical imaging covered in the classes I teach.

Teaching is one of my great joys, but allowing students to teach their peers is an excellent learning activity in itself. I have often invited students who understand the course material to share their insights and learning methods with their peers, especially during test review sessions. This model for student-teaching can also be implemented in the classroom. For example, in advance of a long lecture, I may ask a student to prepare a 1-2 minute lecture from one my PowerPoint slides so that they can teach the class in my place. This would keep the teaching "fresh" but also emphasize the fact that the students will someday be accountable for the same material in the professional world where many will rely on their accurate and up-to-date knowledge. Through my oversight of this process, I can guide students toward more accurate and effective communication in the sciences as they learn to talk intelligently about such topics in a group of equally qualified peers.

In a continued effort to keep material fresh and interesting, I like to maintain a dynamic classroom with various forms of student participation and active learning opportunities. In addition to student-teaching opportunities, I have implemented "Think-Pair-Share" activities (McKeachie, 2006) interspersed between 20-minute periods of lecture. During these activities, students think about a written or hypothetical problem for a minute, write for a minute, and share their thoughts and answers with a neighbor. I give feedback and answer student questions during this time. Think-Pair-Share activities help students to generate thought-provoking questions which enhance learning (King, 1990; Pressley *et al*., 1992). In addition to being a great learning tool, Think-Pair-Share is also a method for fostering a community-based learning environment where students are free to participate and share in general discussion and analysis of the material.

Assessment Strategies

As I plan to teach my first classes as lead instructor, I hope to accommodate students with varied learning styles (reference Myers Briggs questionnaire and VARK learning style inventory). For this reason, group work and presentations will constitute a major component of my overall assessment strategy. Group projects and in-class presentations promote good communication skills by calling on all the learning styles in one form or another: charts and diagrams for visual learners; text references and reports for readers and writers; active and energetic presentations and demonstrations for kinesthetic learners; and oral presentations to appeal to the aural learning style. For example, a unit covering advanced CT topics could culminate in the completion of several interesting and informative group projects: FDK reconstruction, iterative reconstruction, streak artifact reduction, and a contrast enhancement study could all serve as challenging project ideas.

Group work achieves the positive exchange of ideas between learners of all styles. Furthermore, allowing students to anonymously evaluate the contributions of other members within their group can encourage active participation and contribution from everyone. Finally, the in-class presentation

component prepares students for conference-style presentations where they are responsible for relaying concise, interesting, and accurate results and information to an interested audience of peers.

Other assessment methods include standard fare for science courses. Written homework assignments will be used to assess students' problem solving methods and logic on a regular basis (see sample homework assignment from MEDPHY331). Low-stakes writing and quizzes can also be used to monitor student performance at regular intervals (see sample practice quiz and test from PHYS111 and PHYS112). Oral and written exams will evaluate students' abilities to recall key concepts in application to unique real-world problems which require critical thinking and an understanding of the interplay between basic principles. Short papers will demonstrate the development of students' research skills which include the critical evaluation and interpretation of professional literature, amassing evidence to formulate and support a solid argument, and assessing the impact of an experiment or study to name a few. By the end of my courses, students should be equipped with improved mastery over these tools and practices of the professional scientist.

Conclusion

As I anticipate and assume future teaching roles, I continue to foster community-mindedness in my students as they grow into their roles as professionals. Valuable student questions, feedback, and evaluations have helped to create an efficient and effective learning environment both inside and outside of my classroom. Good research skills are enhanced and encouraged through practice and observation. Students will continue to demonstrate independent thinking and improved skills in reasoning and communication through participation in Think-Pair-Share activities, presentations, and other regular class activities. Ultimately, my hope is that students will leave my courses in ownership of their education with a sense of responsibility not only to themselves, but also to their communities where they share in their experiences, knowledge, achievements, and advancements.

References

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