Brian Washburn’s
Statement of Teaching Philosophy

1 Introduction

Studies of the teaching of science are transforming the way educators think about the best approach for physics instruction. It has been found that students learn better when they experience active class participation, study common themes during a course, explore examples before the lecture, and engage in group activities on a subject [1]. More traditional “teacher-centered” approaches are under scrutiny, where a “student-centered” approach may be more effective method of education [2]. In student-centered approach, the class structure is centered on the needs and abilities of the students. This approach is beneficial since learning is most meaningful when topics are relevant to the students’ interests and when the students themselves are actively engaged in connecting to knowledge [3]. However, it is important to realize that different teaching methods are needed for different student levels and backgrounds. Students of different majors (science or non-science major) may learn physics better using different approaches than what is used for physics majors. For example, a student-centered approach may be beneficial for a class for non-physics majors since it will get them more involved in a topic that at first may be intimidating to them. In contrast, it may be difficult to implement a student-centered approach that would provide a rigorous understanding of the topic for an upper-level physics class. Thus, different teaching philosophies are needed for different student audiences.

2 Student Audiences

From my experience in teaching undergraduate physics, I can distinguish four student audiences which need the benefit from different teaching philosophies. The first student audience includes non-science majors that would typically take a conceptual introductory physics class, the second includes science and engineering majors that would take an algebra-based introductory level class, the third includes science and engineering majors taking an introductory calculus-based physics class, and the fourth includes science and engineering majors taking upper-level physics classes. Student-centered approaches with the generous use of demonstrations and group discussion would provide the first two audiences with the best learning environment. For the third and fourth audiences the student-centered approach may be also beneficial for the student, as long it is not at the cost of the losing intellectual rigor of the material. Students from these two audiences may also benefit from a more concept-based curriculum [1]. For example, the junior year curriculum at Oregon State University consists of three-week modules (called Paradigms) that cover physics topics that are common to many areas. The curriculum allows the student to learn important, ubiquitous physical concepts and to connect what they have learned to different subdisciplines.

3 Role of Technology as a Teaching Aid

New technological aides for teaching physics seem to be very attractive and worthwhile tools. However, it is important to remember that technology should be used as a tool to aid, and not to hinder, the teaching of physics. In some instances, these aides can demonstrate complex concepts to the student; in other instances they can prevent conceptual understanding. Here, I would like to focus on the use of computers and other devices to aid classroom instruction. Computer visualizations of physical phenomena can clearly demonstrate in the classroom a
specific concept. Plus, these visualizations can be accessible to the student outside the classroom via the World Wide Web. Although these visualizations have the advantage of being more accessible and conceptual for the student, the disadvantage is in the time for the instructor to devolve and program these visualizations. Another interesting new aid for classroom instruction are personal remote-control “clickers” (manufactured by a company called Hyper-Interactive Teaching Technology for example) that provide students with real-time input during the class. Software that is associated with clickers allows the instructor to incorporate questions in the lecture. The instructor can pose a question and the students can “vote” from a choice of solutions. The votes are tallied in real-time and the instructor can discuss the correct answer. The advantage of this technology is that the students have an active engagement in the class and the instructor gets instantaneous feedback on the students’ understanding.

The role of technology as a teaching aid is also dependent on the student audience. Computer visualizations would work very well for students of the first three audiences above. For upper level courses, it may be more difficult to generate clear computer visualizations of complex physical concepts and provide the student with the mathematical understanding of the concept. Again, caution must be used in order for the computer visualizations not to inhibit the students understanding of the material.

4 Diversity in the Physics Classroom

One aspect that has not yet been included in determining student audience is the overall diversity of the student body, in other words, considerations of race, ethnicity, and gender of the student audience. While topics covered by a physics course are typically not race or gender sensitive, the instructor still must be considerate to the diversity of the student audience. Thus, the instructor must treat students with individual respect and refrain from exclusive language patterns [4].

5 References