Multiplying Physics Enrollment—Strategies that Work

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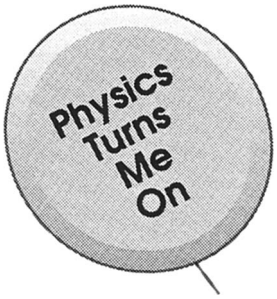
Articles have appeared recently in *The Physics Teacher*[1] concerning the more nontechnical aspects of teaching physics and the prospect of increasing physics enrollment, especially among groups of students who would not normally take a course in physics. I have spent the past five years creating and advertising a physics program that appeals to the majority of students, but sacrifices neither rigor nor content. I have a two-pronged approach: first to extensively publicize the class at school and second to move the course out of my classroom and into the home.

Advertising Physics at School

One strategy I use is to never do a lab inside when it can be done outside. Seeing the physics students working and yet totally enjoying their time outside is a great advertisement to the younger nonphysics students who gaze forlornly out their classroom windows at us. One example of an outside activity I do is the Rocket Lab in which students build and launch model rockets. When I introduce vectors, I have students find the displacement between two cones located on the school track. They do this by starting at one cone and walking in the opposite direction around the track toward the other cone, counting their paces in straight-line segments and measuring their directions with compasses. I often take students out for a quick demonstration that lasts only ten minutes, but even in these short ventures they seem more energetic when they return, and the inevitable observers in the windows are left with a favorable impression of what goes on in physics.



For the last several years I've had my students design physics buttons to be worn both on and off campus. Scattered throughout this note are illustrations of buttons from the last four years. Students love being part of this. The buttons announce in an indirect way that the bearer is a Tamalpais student of physics—no small statement for the student who has had academic difficulties in the past. The excitement of wearing the buttons fades a bit after a few weeks and they normally end up getting placed on backpacks. But I encourage students to all wear their buttons on certain special days that I call "Physics Solidarity Days." It's a remarkable experience to walk about campus on these days. Everywhere you go you see button-bearing students; some alone, some together with other physics students, some amongst groups of athletes or thespians. The message to the observer is clear: there are a lot of physics students on this campus, they come from every group and clique, and there is something special about taking that class.

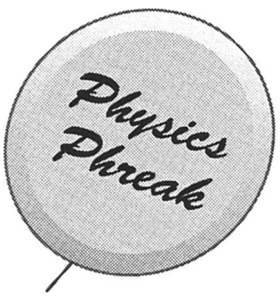
Another idea I use for advertising my program at school is with physics bulletin questions. Once or twice a week, I'll put a short and semicryptic physics statement or question in the daily bulletin. For example:

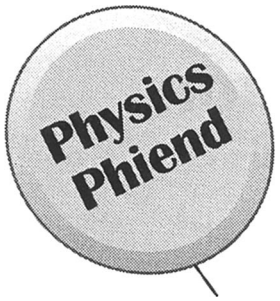
You've probably always believed your car had one accelerator. 120 Tam physics students can explain why each car actually has three accelerators. Ask one!

The Earth has a mass of 5.96×10^{24} kg, but most physics types would say it weighs less than 200 pounds. Ask any of Tam's 120 physics students to explain.

Twinkle, twinkle, little star, how I wonder...why you twinkle. Wonder no more. Ask a physics student.

The bulletin inserts have a nice effect. A teacher reading the bulletin may ask if there is a physics student present to answer the query. If so, the student has the opportunity to shine as he or she explains the question or statement. Even if it's a class with no physics students, the bulletin plants a seed of interest. The





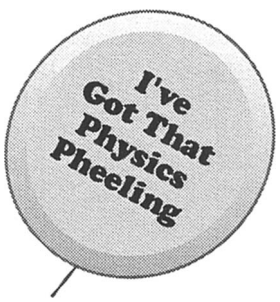
students hear about a class that answers relevant questions. So the message is repeated in one more venue—don't miss this course in physics; don't be left out.

Advertising Physics at Home

The second part of my program is to acquaint parents with the course in physics at Tamalpais High. This program has two components: Dinner Table Physics and Dinner with the Family.

Once or twice a week I offer my students an extra-credit opportunity. The extra credit is worth 10% of a lab and I call it Dinner Table Physics. I ask students to present a specific physics demonstration at home. It might be a replica of one of my Newton's First Law demonstrations or the formation of a real image from a shaving mirror or the sound wave resonance from a wine glass. The requirement is that students perform the demonstration and teach the physical phenomenon illustrated. Then, to receive the extra credit, the parents must write about what they've learned and the student must turn it in the next day. I deadpan with the students that my objective is to draw them closer to their parents in this sometimes difficult adolescent period where parents (and their children) are often tolerated more than appreciated. But, two real benefits are that students learn the material better and parents hear what is going on at school in physics. Teachers understand better than any others how well a concept is learned if it has to be taught. My students relate that they really "get it" after they have had to explain a concept to their parents in a few different ways before they understand.

The other component of my advertising-physics-at-home program is Dinner with the Family. It has been a wonderful experience. Four years ago I decided that I would visit a different family's home each Wednesday night. I announced in each of my classes that I was available to come over for dinner and that they could put their names on a sign-up list on one of my chalkboards. Finally, after a couple of weeks and no takers, I coerced the president of the student body (a student of mine at the time) to invite me. Remarkably, the sign-up list filled the next day and it has been full ever since. I now have 30 to 35 dinners a year with families of students. Sometimes two or more students will get their respective families together for a big multifamily dinner. Some dinners are modest. Others are elaborate and formal. Still others celebrate the ethnic heritage of the family. But no matter how many or how few people are present, no matter the type of home or the style of food served, parents are amazingly appreciative that I am dining with them. All the families want to hear the story of how I became a physics teacher and everyone wants to talk about physics. By the end of the evening parents and siblings are pretty excited about physics. Word gets around—the parent underground is amazingly efficient and interconnected. The net effect is that the physics program is advertised very positively.



As anyone who teaches physics knows, physics is a whole lot of fun. The problem has always been to convince the masses that physics is not only fun, but comprehensible. We have a student population of 900 in grades 9 through 12. Using the strategies outlined in this paper, the typical enrollment in our physics program has increased over five years from approximately 30 students per year to 120 to 150 per year.

Reference

1. M. Grote, "Recruiting students for high-school physics classes," *Phys. Teach.* **32**, 350 (September 1994) and "Sure you care, but do students know it?," *Phys. Teach.* **33**, 92 (February 1995).