

Racial and Gender Issues with Physics in the Pacific Region

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This paper examines the state of physics teaching and learning in the Pacific Island nations. How have things changed in teaching physics? We believe that some of the goals and many of the challenges faced today have changed very little over the years. This paper is purely based upon the authors' experiences in teaching physics at the first-year level at the University of the South Pacific (USP). USP is a typical medium-sized teaching and research university as compared to universities internationally. In the Pacific, it is the biggest university and is effectively serving the 12 Pacific Island nations. Consequently, the findings described here should represent the overall situation for the Pacific region. Perhaps some of our results will resonate with readers in other locations as well. Worldwide, university students often find studying physics to be very challenging, and only a small fraction of them choose physics as a major for their degree or as a career.¹ Students at USP are not an exception and here we describe the severity of the problem.

Teaching physics has never changed here in Fiji. A hundred years ago our predecessor colleagues delivered their lectures, assigned their students to read some relevant textbooks, and gave them questions and problems to solve just as is done today. In their lectures, the instructors showed students how to solve some difficult problems. Undoubtedly, these teachers faced the difficulty of their students' appalling lack of dedication, lamenting the fact that they often had not read the material assigned nor had they understood the lectures, as demonstrated by their poor performance on the exams.² Present-day lecturers echo the same concerns as those of the last century. In fact, frustration exists on both sides, lecturers and students. According to course evaluation questionnaires at USP, students complain that they do not see the relevance of classroom material to what they want to do for the rest of their lives. In this paper we are more interested in the racial and gender issues found in the learning and teaching of physics in the Pacific region since indigenous islanders make up approximately 37% of the student body of our university and there were almost three times as many male students as females between 2002 and 2006. For these reasons alone, we believe that something needs to be done to improve the situation.

Background

USP serves 12 Pacific Island countries and approximately half of Fiji's population consists of Indo-Fijians.³ This might lead one to believe that USP should be a haven of diversity and equality, but in reality racial and gender imbalances in physics classes have been substantial over the years. One possible reason for the racial imbalance is that the vast majority of in-



Fig. 1. Physics students enjoying their simple laboratory experiment.

igenous islanders enrolled at the university stay away from physics. We have begun to consider how to inspire and motivate the indigenous islanders and female students to study physics or science in general to improve the proportion of indigenous islanders as teachers at USP.

Another interesting and alarming fact is that although there are nearly 300 students who take physics at the first-year level, the number drops to about 50 in the second year. This is because of the low "pass" rate and/or low interest in physics. The pass rate is generally about 50% at the first-year level and this reflects the popularity of physics at USP. In the end of the program of study, there are 30+ graduating students with a physics major, of which very few are females, and less than five or so return to do postgraduate studies in physics. We wonder if we are failing to deliver some essentials to our students, since they do not enjoy physics and opt for other subject combinations after their first year. This situation shows indigenous and female populations not appreciating and often failing first-year physics. The small number of students pursuing physics in the second year triggers the concern to find what is lacking in the teaching of the first-year physics course. So far, we have found no previous study on this issue at USP in our review of the literature since the establishment of USP in 1968.

Our approach

In examining the problem, we have employed both qualitative and quantitative methods. The main focus of our analysis has been on our first-year level students' enrollment lists and

the final exam results, together with end of semester student course evaluation questionnaires. An analysis of the number of students enrolled in physics at USP for the last five years (male, female, islander, and non-islander) and their performance was carried out using existing records.

Data and discussion

At the first-year level, we offer three physics courses; two are usually taught during the first semester and one in the second semester. Of the two first-semester courses, one is a core course for physics majors and the other is an elective course for other science students. The second semester course is also a core course for physics and engineering majors.⁴ The available data for the last five years (2002-2006) are summarized in Table I. The table shows the total initial enrollment in physics and the pass rates. Because USP serves 12 Pacific Island countries and approximately half of Fiji's population is Indo-Fijian, one might expect that our introductory enrollments would be quite racially balanced. In fact, our data show that for the period 2002-2006 the average enrollment of indigenous islanders (almost entirely Indo-Fijians) was about nine percent lower than that for the total of other nationalities. Over that period the average pass rate for indigenous island students was approximately 54%. That for other nationalities was a bit higher, just over 59%. We have noted that our indigenous island students are more often absent from class and frequently report on their class evaluation questionnaires that they did not enjoy the physics lectures.

During the period we studied the number of females who took our introductory courses averaged only about one-third of the number of males. The average pass rate for women was 67%, while that for men was only 48%. Our female students clearly perform better than their male classmates and yet the percentage of USP women who take physics (about 2.8%) is much lower than the percentage of men (approximately 8.1%).

Discussion and conclusions

While this small study focuses on introductory physics in the Pacific region, our findings may also have relevance for readers in other parts of the world. We have found that our

Table I. Recent numbers of students and pass rates at USP (first-year level physics).

Year	No. of Students	Pass rate (%)
2002	473	44.6
2003*	680	54.1
2004	751	58.5
2005	783	43.2
2006	705	67.2

* An extra section (size 47) was phased out in 2003

female students are reluctant to enroll in physics even though their performance is significantly better than their male counterparts. Of course, there is a rich body of literature dealing with issues affecting women in physics that we can all benefit from, and numerous studies that provide insights on how our physics courses can be made more attractive to women.⁵ We are reviewing the literature and assessing how we might make our physics classrooms more gender neutral in order to increase the participation of women in our course offerings.

We have also uncovered the need to better persuade and motivate indigenous islanders to study physics. Unfortunately, there are no textbooks written especially for students in the Pacific region, and all examples deal with American situations, some of which are unfamiliar to our students. We make an effort to supplement the texts with examples suited to the Pacific situation and environment, and are redoubling our efforts in this area.

The huge body of work that physics education researchers have carried out over the decades⁶ can also be of great value to us as we attempt to improve teaching and learning in our department. We are studying the literature and working out how various active engagement teaching ideas can be adapted to our own particular environment. At a suitable time in the future we hope to do a follow-up study in which we report on the results of our efforts.

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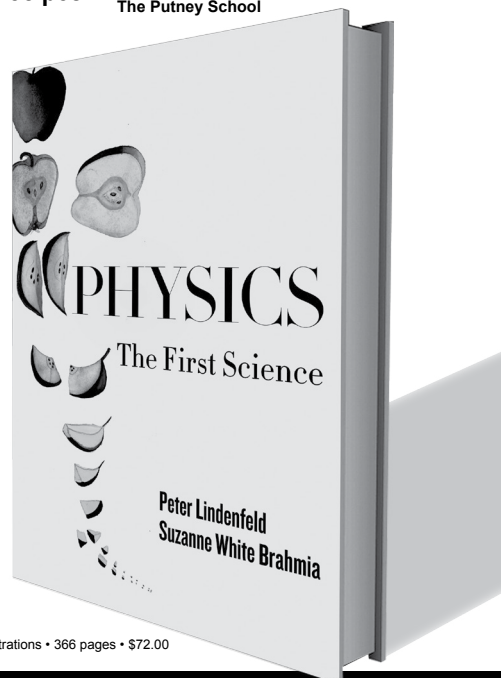
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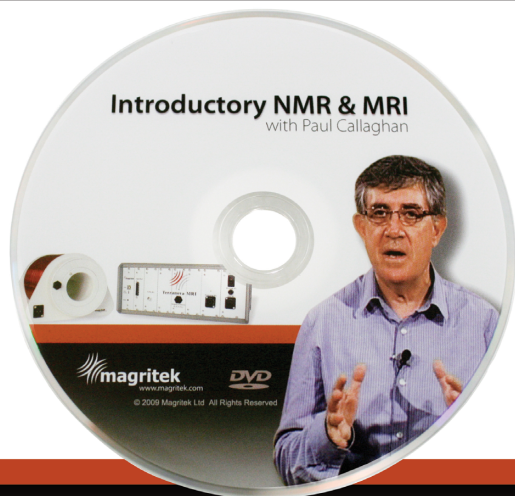
Uma Prasad is a senior lecturer in physics with more than 25 years experience, with a background in electrical physics. Her knowledge and experience is an asset to the physics department. She always tries to look for ways to improve student performance and her approachable personality is appreciated by her students.

"I just love the book and am very excited about using it. For the first time I feel like beginning students have an aide other than the teacher that will help them learn to think rather than simply follow recipes."—Glenn Littledale, Science Department Chair, The Putney School



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