ASSESSMENT AND PREDICTION OF SUCCESS IN FIRST YEAR PHYSICS AT AN AUSTRALIAN UNIVERSITY

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ABSTRACT

A method of assessment, involving six one-hour tests, with provision to repeat four of them, has been used with favourable student and staff reaction in first year, two semester undergraduate physics courses. The style of question and marking criteria used previously in a conventional examination are retained.

The relationship between performance in Physics I, high school background and mark in the first physics test, held in the fifth week of the university course, are investigated through a series of regression analyses. An attempt is made to arrive at an appropriate entry criterion for admission to Physics I.

This paper discusses two aspects of the teaching of first-year physics at the University of New South Wales, namely:

(i) the method of assessment; and

(ii) the prediction of success rates, with implications for the selection of students.

Description of Physics I Subjects

The School of Physics at The University of New South Wales serves approximately 1800 first-year undergraduate students in twelve different Physics subjects. These may be grouped into six categories:

(a) a high level course for very able students, 1.011 Higher Physics I;
(b) a standard professional course, 1.001 Physics I;
(c) a non-calculus course, 1.021 Introductory Physics I (for the Health and Life Sciences);
(d) calculus-based servicing courses for schools in the Faculty of Engineering: 1.951 Physics I (Mechanical Engineering), 1.961 Physics I (Electrical Engineering), 1.971 Physics I (Surveying) and 1.981 Physics I (Civil Engineering);

(e) specialised servicing courses: 1.931 Physics I (Building), 1.941 Physics I (Medicine) and 1.991 Physics I (Architecture);

(f) courses for non-science majors: 1.901 Astronomy and 1.911 Energy.

Of these, the subject 1.001 Physics I will be described in most detail, as it is the largest with a final enrolment of approximately 550 students, and is the only one offered part-time. It is also the least specialised subject, servicing students mainly in the Faculties of Science, Applied Science, and Engineering (part-time). Most of the other first-year physics courses, while differing in detail, follow the same principles of teaching, assessment and organisation as described below.

The 1.001 Physics I course is based on the text by Weidner and Sells (1975), although texts by Bueche (1969) and Halliday and Resnick (1966) have been used previously without major modification to the course. Topics covered include classical mechanics, electricity, thermal physics, waves, physical optics and modern physics. The teaching of each topic is fairly standard, with emphasis being placed on physical principles and problem solving.

Each week the students attend three lectures in large groups of around 200, and one tutorial in a small group of about 16. Sheets of tutorial problems are issued weekly, in addition to a study guide purchased at the start of the year with the laboratory notes. Students also spend up to two hours per week in a self-paced laboratory, where the emphasis is on the mastery of experimental methods. Laboratory work is assessed separately.

Part I: Assessment Procedures

The academic year is divided into two sessions, labelled I and II, each of 14 weeks duration. During each session, students are assessed by two tests each of one hour, held on the Saturday mornings at the end of the fifth and eleventh weeks. At the end of session, there is a third test of similar length during the normal University examination period. During the three hour examination time available at the end of session, a student may choose to repeat either or both of the earlier tests (in alternative forms), with the better of the two marks for each test being counted. Some students do not attempt one or both of the tests during session, but postpone their effort until the end-of-session examination.

Previously, the assessment scheme was based on 4 tests per session, each of 45 minutes duration. However, the total work load involved in setting, marking and other administrative duties plus the smaller coverage of topic