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ABSTRACT

This article describes the placement testing program, the use of microcomputer software for scoring and analyzing test results, and the integration of the computerized test results into a comprehensive microcomputer-based student information system at the University of California, Irvine (UCI). UCI offers placement tests in five academic fields: chemistry, mathematics, reading, writing, and English as a second language. Test content closely parallels UCI courses. Tests are offered six times a year. UCI academic departments determine the grading criteria for each test, based on performance of prior students and on the availability of courses. Students are notified regarding test results, and copies are sent to academic counselors. The microcomputer-based student information system will contain information on students' use of academic support services, grades, demographic information, and academic background, as well as placement test information. The PAR Testing System, a comprehensive test preparation, analysis and record keeping software program, contains an error log and is menu-driven. Summary information, including means and percentages of students placed in each course, are provided to the academic units. Test statistics, including reliability and item analyses, are sent to the unit which developed the test. Counselors receive listings containing all test scores and the corresponding course placements. (PN)

# USING MICROCOMPUTER SOFTWARE TO SCORE PLACEMENT TESTS -- AN EXAMPLE FROM THE UNIVERSITY OF CALIFORNIA, IRVINE

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# USING MICROCOMPUTER SOFTWARE TO SCORE PLACEMENT TESTS -- AN EXAMPLE FROM THE UNIVERSITY OF CALIFORNIA, IRVINE

The University of California, Irvine (UCI) offers placement tests to new students to determine enrollment in courses. In order to provide placement testing information to students and academic counselors in a timely fashion, UCI is using microcomputer software to score, report and analyze placement testing results. This article describes the placement testing program, the use of microcomputer software for scoring and analyzing test results, and the integration of the computerized test results into a comprehensive microcomputer-based student information system.

## UCI's Placement Testing Program

UCI invites all newly-admitted students to participate in the New Student Assessment Program, which offers placement tests in five academic fields: chemistry, mathematics, reading, writing, and English as a second language (ESL). Since these tests are used to place students in a given sequence of University courses, their content closely parallels the demands of University courses. The UCI academic departments are solely

responsible for the selection of the tests and the criteria used in making placement decisions. Placement tests do not replace tests used to determine eligibility for the University, such as the Scholastic Aptitude Test (SAT) and the College Board Achievement Tests. Students are required to take admissions tests before entering the University; the UCI placement tests are specific to UCI courses and are required for only certain areas of study.

In some cases, students are exempt from taking placement tests based on their admissions test results or test scores from the College Board Advanced Placement Program. Seven tests are offered in the five areas of study: one in chemistry, two in mathematics (intermediate algebra and precalculus), one in reading, one in writing, and two ESL tests (reading and writing). The chemistry test is required for students wanting to enroll in general chemistry. The intermediate algebra test is recommended but not required for mathematics courses; however, the precalculus test is required for students planning to enroll in calculus. The reading test is recommended for those who may have difficulty with University-level reading assignments (defined as SAT Verbal 400 or below). The writing test (a two-hour essay) is required of those students who have not satisfied the University's entrance requirement of an acceptable level of ability in English composition. The ESL tests are required of some international students who are non-native speakers of English.

The tests are offered six times a year, starting in May and ending the week before classes begin in the Fall Quarter. Approximately 2,600 new students (freshmen and transfers) will participate in the testing this year (total undergraduate enrollment is approximately 10,000). Students take two to three tests, depending on their course of study. Although students are not encouraged to repeat tests unless substantive learning has taken place between test dates (such as a summer school course), they may do so, with the exception of writing and ESL. If a student repeats a test, the highest score is used to determine course placement.

The academic departments determine the grading criteria for each test, based on performance of prior students and on the availability of course offerings. The Chemistry and Mathematics Departments assign students to one of three groups: 1) ready to take the first course in the sequence, 2) may take the first course but should do further studying before the course begins, and 3) not ready for the first course. In the latter case, students are advised to take a lower-level course at UCI or at a community college and are not allowed to enroll.

The Department of English uses two raters for each writing test. Each rater assigns a holistic score of 1-6 for a total number of points from 2 to 12. Students with high scores (10-12) satisfy their lower-division writing requirement. Students with mid-range scores are asked to take a writing course to satisfy this requirement. Those with lower scores (2-3) are asked to

enroll in special sections of the course and to enroll in adjunct writing workshops. Some students are referred to the ESL Department for further evaluation.

Results from the reading test are used to determine enrollment in non-credit reading courses, such as Vocabulary Development or Critical Reading, which are offered by the Learning Skills Center. The ESL test results are used to place students in one of four credit-bearing ESL reading courses and one of four credit-bearing ESL writing courses.

Students are encouraged to take placement tests as soon as possible after being accepted by the University, in case additional preparation is necessary before enrolling in courses in the Fall Quarter. If a student takes the tests in May, individualized letters are sent to each student informing him/her of the results of each test. Copies of the results are also sent to the academic counselors. During the summer when most of the academic advising occurs, test results are posted in departmental offices and sent to academic counselors.

## Using a Microcomputer for Scoring and Analysis of Test Results

In 1985, the New Student Assessment Program purchased an IBM PC/XT and a Scan-Tron 2100 optical card reader to score and analyze the placement test results. Prior to 1985, test results were scored by a Scan-Tron machine connected to a Sigma 7 mainframe computer housed at the University's Computing

Facility. The change from mainframe to microcomputer was precipitated by several factors.

One of the most significant factors was the development of a microcomputer-based student information system by the Office of Undergraduate Studies which manages the New Student Assessment Program. The information system, which will consist of six to ten IBM PC/XT's and AT's (one of which will be connected to a host computer), will contain information on students' use of academic support services, grades in courses, demographic information, and academic background. The placement test information is a critical part of this larger microcomputer-based system.

The decision to use a microcomputer to score the placement tests was also a cost-effective move. In two years the microcomputer, scoring machine, and software will be paid for by savings from the computing facility accounts which are no longer needed.

A user-owned system also frees the testing program from dependence on the priorities of other campus units. For example, access to the Scan-Tron machine connected to the Sigma 7 could not be guaranteed since it was a multi-user machine serving the entire campus community. Since turn-around time is a critical component of the placement testing program, especially during the summer, the best way to ensure a quick response was to have a user-owned system.

The interface between the Scan-Tron machine and the IBM PC/XT is accomplished using a software program called the PAR Testing System, developed by Prof. Ralph Lewis of California's Orange Coast College and by John Lucas of Economics Research, Inc. The PAR Testing System is a comprehensive test preparation, analysis and recordkeeping software program which has been in development for two years and field-tested in a dozen high schools, colleges, and universities. PAR accommodates up to 600 students per class and 90 different tests per student. Results can be combined across classes (maximum of nine classes) for cumulative reports. PAR assigns grades based on user-defined criteria (including weighting of items and of tests). Student rosters for each class can be created three different ways: from Scan-Tron forms, mainframe computer systems or the IBM PC keyboard. A unique feature of PAR, in comparison with other test scoring programs, is an error log which identifies students' multiple marks and omitted items. This log is useful in identifying stray marks or poor erasures which are interfering with the test scores. PAR can also be used to assign student codes, such as sex and major, which can be used for analysis.

PAR is a menu-driven program. From the main menu, the user may select one of the following options:

1. Create a class roster or add student(s) to a class
2. Grade or re-grade a test
3. Display or edit a class roster

4. Inspect or modify the grading criteria

5. Generate printed reports

6. Other options

7. Quit

The user selects one of these options and then is prompted with another set of menus to complete the process selected. For example, option 5 eventually leads to this menu:

1. Item Analysis

2. Distribution of Scores

3. Range and Grade Distribution

4. Histogram

5. Individual Student Responses

6. Error Log

Another menu can be used to print rosters and cumulative reports.

PAR is able to create ASCII files which can be "unloaded" to create external files for further analyses (e.g., using a statistical analysis software package).

The minimum configuration needed for PAR includes: an IBM PC (or compatible) with 256K RAM; monochrome or color display; two floppy disk drives or one floppy drive and one hard disk (XT); one 80-column printer; a Scan-Tron reader; one RS-232 serial port for Scan-Tron; and MS-DOS 2.0 or higher. PAR can also use a print buffer (or print spooling software) and a clock/calendar. At UCI, PAR is being run on an IBM PC/XT with 640K RAM with one floppy disk drive and one (10 megabyte) hard disk, an IBM graphics printer, a Scan-Tron 2100, and a Persyst

memory expansion board with RS-232 serial port, clock/calendar, and print spooling software. PAR also requires special Scan-Tron forms which can be ordered from Scan-Tron Corporation (Rancho Dominguez, CA).

Although PAR was designed primarily for classroom instructors, at UCI PAR is being adapted to fit the requirements of large-scale test administration and data analysis. PAR is used to create separate test files for each test given on a specific test date. These test files are combined on each test date and across dates to create cumulative reports. Rosters for each test file are created directly from the Scan-Tron forms. The front side of the Scan-Tron form includes student name, registration number, and special codes (e.g., major). The back side repeats the registration number and is used for students' answers to multiple-choice (5 options) test questions. The back side also contains a three-digit field which is used to record essay test results.

Students receive Scan-Tron forms the day of testing. The staff of the New Student Assessment Program complete the front side, including any special codes, using lists generated by the Office of Admissions. Students use the back side to record their answers. The forms are then returned to the New Student Assessment Program by the test administrators.

Multiple-choice placement tests (chemistry, mathematics, and reading) are scored using PAR immediately after the tests are administered. The Scan-Tron forms with the essay test scores

(writing and ESL) are returned from the raters within 2-10 working days, depending on the number of students tested. As each form is read, PAR identifies multiple or omitted marks, as well as incorrect registration numbers, and allows the user to inspect the error or go to the next form.

After the forms have been read, PAR creates the roster, posts the test results (number correct), and assigns grades based on user-defined criteria. In lieu of grades, UCI assigns students to specific courses based on their test results. For example, the Chemistry Department places students into categories based on the percentage correct:

1) students well prepared for Chemistry 1A ($\geq$ 50%),
2) students who need to review high school chemistry but may enroll in Chemistry 1A (40-50%), and
3) students who may not enroll in Chemistry 1A but should consider enrolling in Chemistry 10 or a community college course (< 40%).

The placement codes are automatically assigned by PAR and appear on the roster.

UCI prints all of the available PAR reports (see above). Summary information, including means and percentage of students placed in each course, are provided to the academic units. Test statistics, including reliability and item analyses, are sent to the unit which developed the test. Counselors receive

alphabetical listings containing all test scores and the corresponding course placements; these are used in summer advising sessions. This fall, the test results will be used to identify high risk students, defined as students placed in three or more remedial classes based on their placement test scores. These students' names will be sent to all academic counselors and academic support programs as part of an early warning system.

It should be noted that the developers of PAR have been extremely helpful in adapting it to UCI's placement testing program. They have helped create the file structure for this application and have written batch files to assist in creating specialized external files. They also suggested an alphabetical schema for use with the 600-student limitation per class. As part of the agreement with Economics Research, UCI has received all updates of PAR at no additional cost. Each update provides additional features that make PAR an even better product.

## Overall Evaluation of the Placement Testing System

Using a microcomputer to score and analyze the placement test results has greatly enhanced the New Student Assessment Program. Tests can be scored quickly and results sent out promptly. Summary information is available for a variety of campus decision-makers, including administrators and academic counselors. Use of the microcomputer also forges a link in the larger microcomputer-based student information system being developed at UCI by Undergraduate Studies.