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Research Report

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Crafton Hills College

Report on Consequential Validity Analysis of the ACCUPLACER® Placement System

Introduction

California Matriculation regulations require that community colleges validate the tests and cut scores they use for student placement. Crafton Hills College undertook to do so in Fall, 2006. Gordon Associates was engaged to guide the process and provide analysis of the data collected. This report is the result of that process.

Crafton Hills College (CHC) revised their placement process the previous year, developing a multiple measures placement process within the ACCUPLACER® system. The system is quite complex and contains many elements beyond test scores to influence placements, particularly into mathematics courses. The analysis presented here examines those complexities, as well.

Gordon Associates is an independent contractor not affiliated with The College Board, the ACCUPLACER® program, San Bernardino Community College District, or Vantage Learning Technologies. Our aim is to help colleges provide to their students the most fair and accurate placement system possible. We were engaged by CHC in Fall, 2006 to conduct a consequential validity study on the placement level classes at CHC. We provided survey instruments and instructions to enable CHC staff to administer surveys to faculty and students in the target classes. This report is the result of those surveys and cooperation from other CHC staff in providing course history information.

Methodology

The consequential validity model of cut score research uses faculty and student input to determine the accuracy of each student's placement, rather than analyzing the performance of each student in the course, because student performance is controlled, in large part, by factors not related to their academic skills. Yet, academic skills is the only factor measured by the placement examination. Faculty and student assessment of each student's placement, in terms of how well prepared the student is to learn at the required level and pace, evaluates the placement system, and is less influenced by the student's study habits, dedication, motivation, and the many other factors that influence how well students perform in classes. Students placed accurately by the placement system still may fail or drop the course, but if they have the academic skills to be

successful, the placement system is working properly. Students who enter classes under-prepared for the level and pace of study required should be highly likely to fail or drop. The placement system should be designed to prevent that.

Placement Accuracy

The placement accuracy model illustrated below shows how the survey relates to students' placements. Students who are either under-prepared or over-prepared for the course are inaccurately placed if they are enrolled in the course recommended by the placement system. Students who are enrolled in courses above the recommended courses are inaccurately placed if

Enrollment ⇒ Placement ⇓	At Placement Level	Above Placement Level
Accurate	Adequately Prepared	Under-Prepared
Inaccurate	Under-Prepared Over-Prepared	Adequately Prepared Over-Prepared

they are judged to be adequately prepared for that course, because the placement system found that they should be in a lower course. The model does not address students enrolled in courses below their placement levels, because doing so is a personal choice which the placement system cannot control.

Students and faculty in each placement-level course at CHC were surveyed for the purpose of assessing the accuracy of each student's placement. Surveys were administered and collected by CHC staff or faculty. The resulting data were submitted to the contractor for analysis in Excel® files. CHC staff also supplied the students' course history to identify those who had taken prerequisite courses from those placed directly into the courses by the placement system. Test scores, placement scores, and background information were downloaded from the ACCUPLACER® system and combined with the student survey and history data.

Analysis

After the various data files were combined, students' identifying information was removed from the file. Data were analyzed using SPSS® statistical software. First, a correlation test between the students' and faculty's responses was conducted for each placement level. By rule, classes for which the faculty/student correlation is less than .60 (Pearson's r) will be analyzed using both variables separately. In this case, all correlations were greater than .60.

The faculty and student response variables were combined to create a single response variable with a value of one (1) to three (3). The faculty responses were weighted double, using the following formula: ((Faculty response #1 * 2) + (Faculty response #2 * 2) + Student response #1 + Student response #2)/6, rounded to the nearest whole number. In this way, the faculty's evaluation counts higher in instances were the student and faculty responses differ.

Each student record was identified by discipline and level, as well as by the method of placement. There were four possible methods of placement for Math, three for English and Reading. Students could have been placed into the course by the placement system, by the prerequisite course, or by challenge or counselor intervention. The latter were identified by having less than the required score (including multiple measures weights) and not having taken a prerequisite course. In Math, students also could have been placed by their prior math history, disregarding the test score. These were identified by having a lower score than required of other students and having provided appropriate Math history information in the background questions.

To facilitate analysis, test scores were placed into brackets in increments of five points. The marker was the midpoint of the score bracket, such that a bracket marked 85, for example, contained all scores between 82.5 and 87.4. For English, the Reading Comprehension (RC) and Sentence Skills (SS) tests were combined in various ratios for analysis. RC to SS ratios of .6 RC to .4 SS, .5 RC to .5 SS, and .4 RC to .6 SS were tested. The optimum combination, that which yielded the highest placement accuracy rate, was .5 RC to .5 SS. That ratio is included in the following report and recommendations.

Courses were coded for their level within each discipline, using a numeric coding value. Students rated "Over-Prepared" were coded into the next higher level, since, by definition, that is where they should have been placed. For example, the analysis for English 101 included students rated "Under-Prepared" and "Adequately Prepared" in English 101, and students rated "Over-Prepared" in English 015.

After the coding was finished, data were sorted and analyzed in frequency distributions at each course level. The response code variable was used to determine the optimum cut score, based on finding the point at which the "Adequately Prepared" response was at or near the maximum, and the "Over-Prepared" response was moderately low. The objective in selecting the optimum cut score was to maximize placement accuracy, but limit the number of over-prepared students in the lower-level course.

Findings

The first set of tables show the findings for placement by the ACCUPLACER® system and placement accuracy for placement by the prerequisite course. Subsequent tables will illustrate the other methods of placement. The ACCUPLACER® tables show the optimum cut score indicated by this data set, the current cut score, the Placement Accuracy--as indicated by the percentage of "Adequately Prepared" responses among the students whose score was at or above the cut score, the percentage of students who would be admitted to the class who were rated Under-Prepared, and the percent of the "Over-Prepared" responses who still will be eliminated at the optimum cut score.

English Composition Placement (.5 Reading + .5 Sentence Skills)						
Level	Current Cut Score	Optimum Cut Score	Placement Accuracy (@ Optimum)	% Under Prepared	Over-Prepared Eliminated*	Prerequisite Placement Accuracy**
Engl 908	< 34.5	<39.5	83.4%	N/A	N/A	N/A
Engl 914	>=34.5, < 72.5	>=39.5, < 74.5	87.2%	7.2	14%	83.5%
Engl 015	>= 72.5, < 92.5	>= 74.5, < 92.5	91.0%	5.1	11%	84.7%
Engl 101	>= 92.5	>=92.5	92.6%	5.0	5%	88.0%

* The percentage of students rated Over-Prepared in the lower-level course who still will be eliminated from the target level at the optimum cut score
** The placement accuracy rate, as defined above, for students placed into the course by taking a prerequisite course.

Except for English 914, the differences between the current and optimum cut scores are within the analysis system's range of standard error. We recommend changing the English 914 cut score to the optimum level and leaving the others as they are.

Reading Placement (Reading Composition Test)						
Level	Current Cut Score	Optimum Cut Score	Placement Accuracy (@ Optimum)	% Under Prepared	Over-Prepared Eliminated*	Prerequisite Placement Accuracy***
Read 925	< 54.5	< 58.5	82.9%	N/A	N/A	N/A
Read 956	>= 54.5, < 64.5	>= 58.5, < 69.5	85.1%	11%	5%	82.0%
Read 078	>=64.5, < 84.5	>= 69.5, **	89.8%	7%	11%	84.5%
Exempt	>=84.5	**	**			

* The percentage of students rated Over-Prepared in the lower-level course who still will be eliminated from the target level at the optimum cut score
** It is not possible to examine those students who are exempt from a reading requirement by reaching the graduation competency score. However, with the score at its current level, only six students were rated over-prepared for Reading 078. This seems to indicate the cut score is properly placed.
***The placement accuracy rate, as defined above, for students placed into the course by taking a prerequisite course.

The differences between the current and optimum cut scores are significant at P < .01. We recommend adjusting the cut scores to the optimum level.

Mathematics Placement (Using Test Indicated)						
Level Test	Current Cut Score	Optimum Cut Score	Placement Accuracy (@ Optimum)	% Under Prepared	Over-Prepared Eliminated*	Prerequisite Placement Accuracy**
Math 942 Arith	< 51.5 AR	< 51.5 AR	88.0%	10%	N/A	N/A
Math 952 Arith	>=51.5	>=51.5, <72.5	84.2%	9%	3%	84.1%
Math 090 Arith	N/A	>= 72.5	84.7%	8%	7%	79.8%
Math 090 Algebra	>=47.5, <64.5	>=45.5, <62.5	88.9%	6%	4%	79.8%
Math 095-6	>= 64.5 Alg.	>=62.5 Alg.	89.9%	8%	2%	85.2%
Math 102	>=64.5, <75.5 CLM Test	>=61.5, <74.5 CLM Test	86.6%	11%	3%	82.4%
Math 108/115[#]	>=64.5, <75.5	>=57.5, < 74.5	84.3%	11%	0%	86.1%
Math 103	>=75.5, <87.5	>=74.5, <87.5	90.4%	8%	6%	87.3%
Math 151	>=87.5, <103.5	>=87.5, <103.5	91.2%	7%	4%	88.8%
Math 250	>= 103.5	>= 103.5	94.0%	5%	9%	91.8%

* The percentage of students rated Over-Prepared in the lower-level course who still will be eliminated from the target level at the optimum cut score

**The placement accuracy rate, as defined above, for students placed into the course by taking a prerequisite course.

[#]Separated from Math 102 because the optimum cut scores differ significantly.

Students with arithmetic scores above 72.5 are highly likely to be able to learn at the required level and pace in Math 090, with approximately the same accuracy rate as those placed using the algebra test.

It appears to require greater academic skill to be successful in College Algebra (Math 102) than in Statistics or Ideas of Math (Math 108 or Math 115). Therefore, the optimum cut score for Math 108/115 is lower than for Math 102.

The optimum cut score for Math 102 is significantly lower than the current cut score.

Recommendations: Allow students who score above 72.5 on the Arithmetic test to enroll in Math 090, regardless of their algebra score.

Separate Math 108 and Math 115 into a separate placement level from Math 102, with a score range on the CLM test of 57.5 to 74.5. This will create a situation in which some students may get placements into the Math 108/115 level as well as into the Math 102 level. Change the cut score for Math 102 to the optimum score level.

No other cut score recommendations are made, since the other differences between the optimum cut score and the current cut score are not statistically significant, and within the error of measurement of the analysis system.

Other Placement Methods

There were a number of students at all except the lowest Reading and English levels who had not achieved the necessary score on the placement examination to be in the course in which they were surveyed. Some of those may have been placement challenges, others probably were simple over-rides of the placement recommendations. In English and Reading, those students had a placement accuracy rate of less than 60% at all levels.

Recommendation: Cease over-riding the placement system. Require that students take the courses into which the placement or prerequisite system places them. Title 5 regulations require that a prerequisite challenge system be in place. Develop criteria under which placement and prerequisite challenges will be accepted, and do not admit students to courses for which they are unqualified.

Math Placements

We have addressed students who were in mathematics courses on the basis of their test scores and on the basis of having met the prerequisite. We have not addressed those who had not achieved either criterion. Those students fall into two categories. One is those students who, as described above, challenged or otherwise received an over-ride of their placement or prerequisite. The other group is those who did not achieve a sufficient score on the placement examination math test to be placed into the course in which they were surveyed, but had the required high school mathematics history and grade to be placed there. The table below summarizes the results for both groups. Note that no students were rated Over-Prepared among this group.

Math Placements by Other Than ACCUPLACER®				
	Prior History		Challenge or Over-ride	
Level	Accuracy	% Under-Prepared	Accuracy	% Under-Prepared
Math 090	58.7%	41.3%	64.1%	35.9%
Math 095/096	51.4%	48.6%	60.4%	39.6%
Math 103	41.9%	58.1%	58.7%	41.3%
Math 151	42.6%	57.4%	60.2%	39.8%
Math 250	40.9%	59.1%	63.5%	36.5%

Recommendation: Use prior course history as a weighting factor along with (not instead of) test scores and other factors for placement in Mathematics courses. Prior history certainly is relevant to students' academic abilities, but the connection between high school and college courses is too tenuous to use it as the sole criterion in placement. In addition, Scroggins, in "Best Practices in Prerequisites" (available through the Statewide Academic Senate web site *http://www.academicsenate.cc.ca.us/Publications/Papers/good_practice_prerequis.html***) states:**

> *You may use a high school course with a 'B' grade as a prerequisite, but there are two things to keep in mind. First, as non-course prerequisites, high school courses require the highest level of scrutiny, data collection and analysis. (You would have to show that, without an 'A' or 'B' in the high school course, students are highly unlikely to succeed.) Second, the regulations require consistency in the use of prerequisites. In the case of high school courses, this may mean that you would have to require high school transcripts for all students who wish to enroll in the class. [This is so impractical as to make the use of high school grades nearly impossible.] The only reasonable alternative would be to have the students self-report their high school course and grade. I doubt if the results would be reliable enough to use.*

What this means is that, first, the practice now in place for math placement at CHC violates Title 5 regulations in that the required "highest level of scrutiny" research has not been done, and second, using self-reported information, while suitable for weighting in multiple measures applications where its influence is somewhat diluted by other factors, does not meet the standards for prerequisite enforcement.

Establish consistent standards for responding to prerequisite and placement challenges and enforce them. In addition, establish standards for over-riding the placement process by limiting the criteria counselors and others may use to place students beyond the assessment process. Many colleges that have established computerized application of multiple measures allow only official challenges to change students' placements.

Evaluation of Multiple Measures

Approximately 14% of placements were adjusted through the weighting scheme in the computerized multiple measures process. We estimate, based upon the survey results, that this improved placement accuracy at all levels by approximately three to five percentage points. In most computerized weighting schemes, 12% to 16% of placements are adjusted by the system. CHC is well within that range, indicating that the current multiple measures scheme is working quite well.

Approximately 16% of placements were adjusted by other means, outside the weighting scheme. These were done with less success. On average, only 47% of students who were placed around the placement system were judged to be accurately placed. Among these, the single course and grade criteria used in math placement is the least accurate. The students who made successful challenges could not be identified from those whose placements or prerequisites were over-ridden without filing a challenge, so no determination can be made regarding the accuracy of the challenge evaluation process.

Additional Background Questions We were asked to evaluate additional questions that are currently being asked in the ACCUPLACER® system but are not now being used in the weighting scheme. By assigning artificial values to the responses, we were able to compare them with the questions currently being used to weight placements. While addition of these items would not improve placement accuracy a significant amount, they do correlate well with the items currently being used.

The addition of more items into the weighting scheme could have the effect of expanding how far students can move beyond where their score alone would place them. Research at other colleges has indicated that students who are placed more than half a placement range above their score-alone placement are significantly less likely to be judged to be accurately placed. That could have the effect of reducing placement accuracy.

Recommendation: The current weighting scheme is working as expected. While it would be OK to substitute some of the extra items for those currently being used, it does not appear to be necessary. It is inadvisable to add more weighted measures to the scheme at this time.