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Models for Combining Multiple Measures in Student Placement and Use of Self-Report Measures Compared to Transcript Data

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In recent years, several studies have been conducted using high school achievement data for placement into English and math courses at community colleges. These studies found that high school data, including grades in English and math courses and grade point average, can be effective predictors of student success and useful as placement measures.

This study is extending this research to consider additional issues related to using high school data for placement. More specifically, it explores the possibility of using self-reported data on high school English and math courses compared to using transcript data for placement. If self-report measures were found to reliably reflect the actual last high school English and math course and performance, logistical challenges in using these types of data would be significantly simplified.

The study also examines different methods for combining data and the effect of the various methods on placement rates. More specifically, it considers three major ways of combining data—conjunctive, disjunctive, and compensatory. Conjunctive approaches require students to demonstrate proficiency on more than one measure. Disjunctive allows students to demonstrate proficiency through any one of multiple measures. Lastly, compensatory approaches combine data in such a way as to allow higher performance on one measure to compensate for lower performance on another measure. Average scores and weighted average scores would fall into this category. Mixed methods would combine elements from more than one of the approaches.

Research Questions

1. To what extent does the self-reported last high school math and English courses at the time of placement reflect the actual last math and English courses taken in the high school senior year?
2. To what extent do self-reported grades in high school math and English courses reflect the actual grades received in the high school senior year?
3. How do placement rates differ for various methods for combining placement data—disjunctive, conjunctive, and compensatory?
4. Are there disproportionate differences for students from various ethnic groups or males and females? (Not sure if we can actually assess this. But, included it as a placeholder in case.)

Methods

To inform these questions, high school senior year courses, grades in high school senior year courses, cumulative grade point averages in high school, English placement, math placement, self-reported last English and math course completed (at time of placement), college English course, college math course, college English course grade, and college math course grade were combined. High school and college data were combined based on name and date of birth for a single high school district and its feeder community college. Once data were combined, indefinable data (name, date of birth, and identification numbers) were deleted.

Population

Students from a single high school district who were in the 12th grade in 2011/12 or 2012/13 were included in the study. For students from the high school district who enrolled at a feeder community college, high school data were combined with data from the community college. For the 2011/12 cohort, out of a total of 3,754 students, data for 1,828 students were matched with college data. For the 2012/13 cohort, out of a total of 3,984 students, data for 1,804 students were matched with college data. For 2011/12 matched students, the ethic distribution was as follows: 8.9% Asian/Asian-American, 4.5% African American, 4.7% Filipino, 32.0% Latino, 0.9% Native American, 2.3% Other, 0.3% Pacific Islander, 45.9% White, and 0.3% Unknown. For 2012/13 matched students, the ethic distribution was as follows: 8.9% Asian/Asian-American, 3.9% African American, 5.2% Filipino, 33.2% Latino, 0.8% Native American, 1.2% Other, 0.5% Pacific Islander, 45.8% White, and 0.6% Unknown. In relationship to sex for the 2012/13 cohort, 52.9% were male and 47.1% were female. For the 2012/13 cohort, 51.5 % were male and 48.4 % were female.

Procedures

High school English courses were combined into the following groups:

1. American Lit, Bible as Lit, British Lit, Legend King Arthur, Myth and Folklore, Science Fiction, Shakespeare, and Sports Literature
2. Advanced Comp
3. English 12
4. Honors courses
5. Advanced Placement Courses

Math courses were grouped as follows:

1. Algebra 1
2. Geometry
3. Algebra II, Algebra II/Trig, Honors Algebra II/Trig
4. Trigonometry
5. Pre-calculus and Honors Pre-calculus
6. AP Calculus and AP Statistics

College placement was based on Accuplacer scores in accordance with the community college's existing placement cut scores (see Appendix A).

The following methods for combining data were used:

1. Disjunctive
    a. Receiving grades of A or B in high school English 12, Honors English courses, or AP courses during the senior year or receiving a placement of English 101 based on Accuplacer.
    b. Receiving grades of A, B, or C in high school English 12, Honors English courses, or AP courses during the senior year or receiving a placement of English 101 based on Accuplacer.
2. Conjunctive
    a. Earned a grade of A or B in high school English 12, Honors English courses, or AP courses during the fall and spring semesters.
    b. Earned a grade of A or B in high school English 12, Honors English courses, or AP courses during the fall and spring semesters and placed into English 101.
3. No Combining: Accuplacer Scores Alone

Results

Assessment of Self Report Data

The first set of analyses assessed the degree to which self-reported last math classes and grades were similar to the actual math class and grades during the students' senior year of high school. As indicated in Table 1, there is a very strong relationship between the self-reported math classes and the actual math classes ($X^2(24)=542.35$, $p<.001$ for 2011/12 cohort and $X^2(20)=835.86$, $p<.001$ for 2012/13 cohort). There was very little evidence that students inflated their last math course. In fact, many students self-reported a lower last math course than they actually had taken, which could reflect students completing the placement test (and self-report items) prior to their senior year of high school.

Table 1. Comparison of Self-Report Highest Math Course and Actual Math Course Senior Year of High School (2012/13)

		Actual Math Course Senior Year of High School						
		Alg I	Geom	Alg II	Alg II / Trig	Precalc	Calc	Total
Self Report Senior Year Math Class	Algebra I	**6**	8	11	0	1	0	26
	Geometry	1	**64**	37	8	5	1	116
	Int Alg / Alg II	1	26	**150**	15	37	4	233
	Trigonometry	0	0	**24**	**11**	41	2	78
	Precalc or Calc	0	1	0	0	**104**	**161**	266
	Total	8	99	222	34	188	168	719

Similarly, there is a very strong relationship between self-reported last math course grade and actual math course grade during the fall semester of the senior year. In terms of the high pass comparison (whether or not they earned an A or B vs. any other grade), the match was very strong, with 77 percent agreement (($X^2(1)=74.63$, $p<.001$ for 2011/12 cohort and $X^2(1)=214.61$, $p<.001$ for 2012/13 cohort)). The match for passing also was significant, though not quite as strong (($X^2(1)=48.38$, $p<.001$ for 2011/12 cohort and $X^2(1)=135.37$, $p<.001$ for 2012/13 cohort).

Table 2. Comparison of Self Report High School Grade with Actual Senior Year High School Grade: High Pass

		Self-Report HS Grade Fall Term		
		A or B	C, CR, D, or F	Total
Actual HS Grade Fall Term	A or B	**238**	69	307
	C, D, or F	94	**322**	416
	Total	332	391	723

Table 3. Comparison of Self Report High School Grade with Actual Senior Year High School Grade: Pass

		Self-Report HS Grade Fall Term		
		A, B, C, or CR	D or F	Total
Actual HS Grade Fall Term	A, B, or C	525	30	555
	D or F	100	68	168
	Total	625	98	723

Models for Placement

A series of analyses were completed comparing models of placement to assess the degree to which the placement would be affected (see Figure 1 through 3 and Table 4 to 6). As expected, the Disjunctive B model (which places students into English 101 with a minimum score on Accuplacer **or** passing an expository English course in their senior year of high school) had the highest placement into English 101, with well over twice as many students placed into English 101 than the number of students placed into English 101 based on Accuplacer alone. Disjunctive Model A, which is similar to model B except that it requires a grade of an A or B in the high school senior year English course had a placement rate in English 101 that was more than twice as high as using Accuplacer alone.

Figure 1. Comparison of Models for Combining Data: English 101

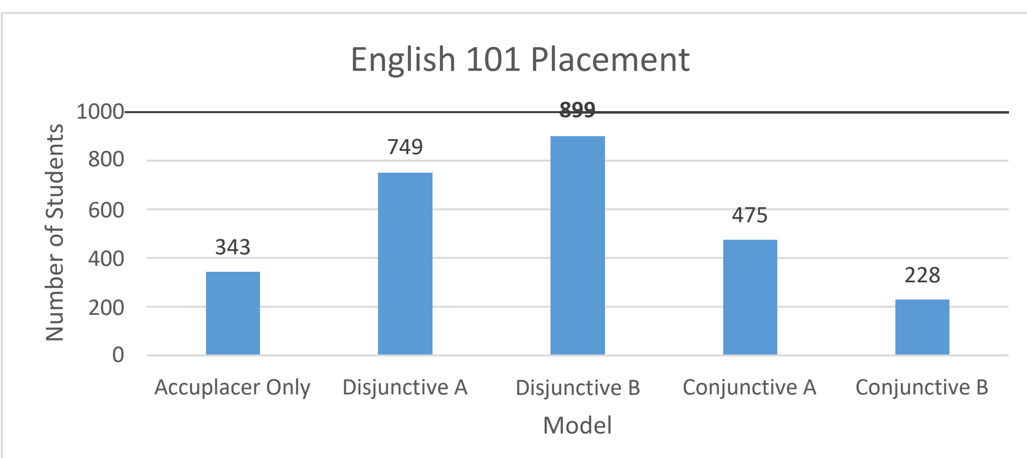

Table 4. Comparison of Placement Rates for Multiple Measures Models in English 101

		2011/12 Frequency	Percent	2012/13 Frequency	Percent
Accuplacer Alone		198	15.8%	343	21.4%
Disjunctive A	High Pass in English 12 or higher **or** Accuplacer	395	31.4%	749	46.7%
Disjunctive B	Pass in English 12 or higher **or** Accuplacer	542	43.2%	899	56.0%
Conjunctive A	High Pass in Fall **and** Spring English 12 or Higher	203	16.2%	475	29.6%
Conjunctive B	Pass in Fall **and** Accuplacer Placement	98	7.8%	228	14.2%
n		1256		1604	

Similarly to the results for English 101, Disjunctive models had a higher placement rate into college-level and transferable-level math courses, though the rates were not as pronounced as were observed with English. For Intermediate Algebra (degree-applicable math), the placement rate in 2012/13 was 46.5 percent using Accuplacer alone and 57.8 percent using Disjunctive Model B, which places students into Intermediate Algebra based on passing Algebra II or higher in the students Fall semester of their senior year in high school. The less pronounced increase is like a reflection at least in part, due to the relatively low enrollment in math course during the students' senior year of high school. As indicated in tables 7 and 8, a large percentage of students did not enroll in math during their senior year and those that did enrolled most likely enrolled in pre-calculus or Calculus and likely were not placed by Accuplacer into courses below Intermediate Algebra.

Figure 2. Comparison of Models for Combining Data: Intermediate Algebra and Higher

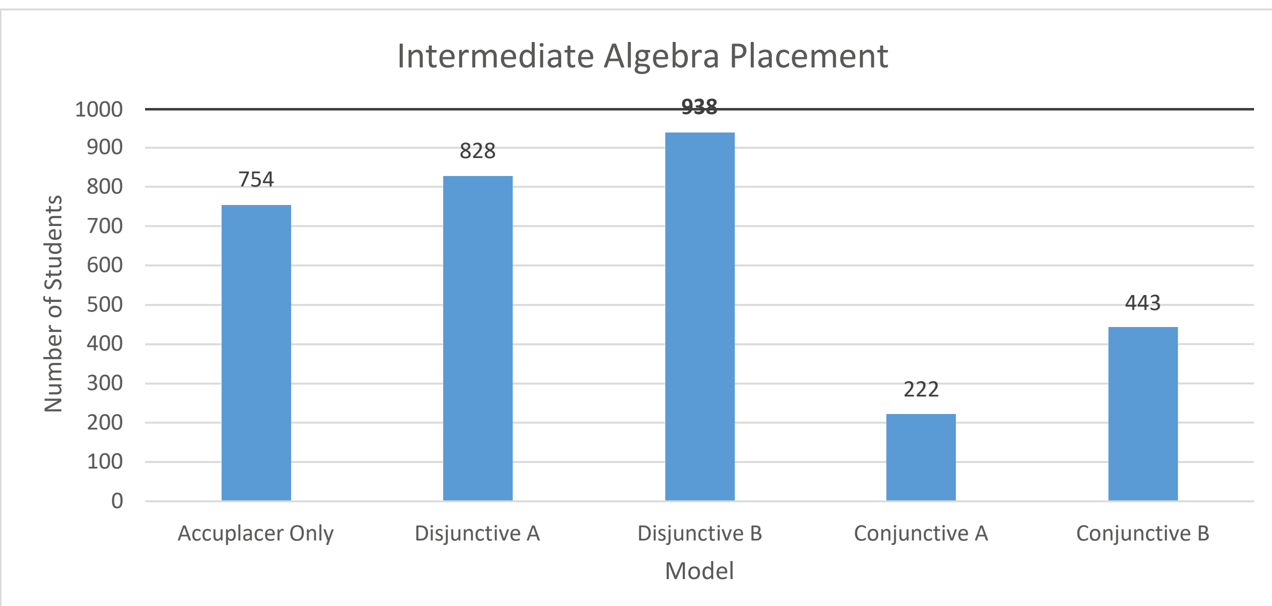

Table 5. Comparison of Placement Rates for Multiple Measures Models in Intermediate Algebra and Higher

		2011/12 Frequency	Percent	2012/13 Frequency	Percent
Accuplacer Alone		504	39.3%	754	46.5%
Disjunctive A	High Pass in Algebra II or Accuplacer	557	43.5%	828	51.0%
Disjunctive B	Pass in Algebra II or Accuplacer	648	50.6%	938	57.8%
Conjunctive A	High Pass in Algebra II Fall and Spring	125	9.8%	222	13.7%
Conjunctive B	Pass in Algebra II and Accuplacer	279	21.8%	443	27.3%
n		1281		1622	

For transferable-level math courses, the disjunctive models had a larger impact than using Accuplacer alone. For example, in 2012/13, the placement rate into transferable-level math courses was 21.1 percent for Accuplacer alone and 32.4 percent using passing Trigonometry or higher or the Accuplacer score.

Table 6. Comparison of Placement Rates for Multiple Measures Models in Transfer-Level Math

		2011/12 Frequency	Percent	2012/13 Frequency	Percent
Accuplacer Alone		167	13.0%	342	21.1%
Disjunctive A	High Pass in Trig. or Accuplacer	216	16.9%	429	26.4%
Disjunctive B	Pass in Trig. or Accuplacer	289	22.6%	525	32.4%
Conjunctive A	High Pass in Trig. Fall and Spring	78	6.1%	175	10.8%
Conjunctive B	Pass in Trig. and Accuplacer	124	9.7%	243	15.0%
n		1281		1622	100.0%

Figure 3. Comparison of Models for Combining Data: Transfer-Level Math

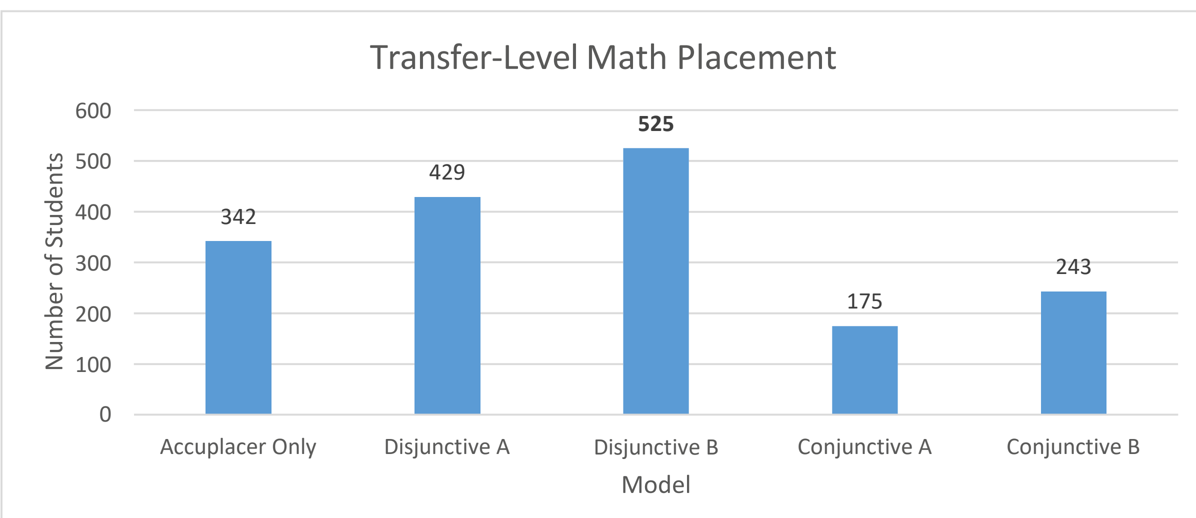

Table 7. Enrollment in Math during the Senior Year of High School: 2011/12

	n	Percent
No Math	1,637	44.0%
Algebra I	29	0.8%
Geometry	255	6.9%
Algebra II	512	13.8%
Trigonometry	46	1.2%
Pre-Calculus	382	10.3%
Calculus	859	23.1%
Total	3,720	100.0%

Table 8. Enrollment in Math during the Senior Year of High School: 2012/13

	n	Percent
No Math or Less than B	2,500	67.2%
Algebra I	20	0.5%
Geometry	63	1.7%
Algebra II	211	5.7%
Pre-Calculus	286	7.7%
Calculus	640	17.2%
Total	3,720	100.0%

Placement Models Disaggregated by Ethnicity

The final set of analyses evaluated the degree to which model selection had a differential impact for various groups of students. For English 101, there was a different impact for students from different ethnic groups, with disjunctive models reducing the differential placement rates for some groups of students. For example, using Accuplacer alone, the placement rate for Latino and African-American students was 14 percent and 17 percent respectively, compared to 24 percent for White students. For the Disjunctive Model B, the placement rate into English 101 was 52 percent and 58 percent for Latino and African-American students, respectively, compared to 55 percent for White students.

Table 9. Comparison of Placement Models Disaggregated by Ethnicity: English 101

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Asian	42%	70%	77%	52%	35%	133
Black	17%	46%	58%	34%	12%	65
Filipino	21%	49%	58%	38%	17%	81
Latino	14%	41%	52%	26%	8%	551
Nat. American	15%	31%	46%	8%	15%	13
Other	23%	46%	62%	8%	23%	13
Pacific Islander						9
White	24%	47%	55%	28%	15%	726
Unknown						8

Table 10. Comparison of Placement Models Disaggregated by Sex: English 101

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Female	23%	51%	59%	35%	18%	770
Male	20%	42%	54%	25%	11%	831

For math, the use of different models did not reduce the differential placement rates for Latino and African American students compared to White students, or only reduced it modestly. However, as previously noted, the model in general had only a modest effect given that a large percentage of students do not enroll in math their senior year, and those who did enroll in math their senior year were most likely to enroll in Calculus or Pre-Calculus and not be placed into lower levels of math.

Table 11. Comparison of Placement Models Disaggregated by Ethnicity: Intermediate Algebra

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Asian	77%	81%	83%	28%	55%	138
Black	32%	37%	43%	9%	23%	65
Filipino	59%	67%	73%	20%	42%	81
Latino	37%	41%	49%	10%	22%	558
Native American	38%	46%	46%	15%	15%	13
Other	43%	43%	43%	7%	21%	14
Pacific Islander						9
White	48%	53%	60%	13%	25%	732
Unknown						9

Table 12. Comparison of Placement Models Disaggregated by Sex: Intermediate Algebra

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Female	47%	52%	61%	15%	27%	785
Male	46%	50%	55%	13%	27%	836

Table 13. Comparison of Placement Models Disaggregated by Ethnicity: Transfer-Level Math

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Asian	57%	63%	67%	26%	46%	138
Black	15%	18%	26%	6%	12%	65
Filipino	27%	40%	52%	19%	23%	81
Latino	12%	17%	24%	7%	9%	558
Native American	8%	15%	15%	8%	0%	13
Other	14%	14%	14%	0%	0%	14
Pacific Islander						9
White	21%	26%	31%	10%	13%	732
Unknown						9

Table 14. Comparison of Placement Models Disaggregated by Sex: Intermediate Algebra

	Accuplacer	Disjunctive A	Disjunctive B	Conjunctive A	Conjunctive B	n
Female	20%	27%	35%	12%	14%	785
Male	22%	26%	30%	10%	16%	836

Summary and Conclusions

The results of this study indicate that self-reported grades and last math course completed is reflective of the actual grades and last math course completed. This has important implications for using high school transcript data in the placement process in that actual transcript data can have logistical challenges which impacts colleges' ability to use the data for placement. These logistical challenges include the workload involved with manually reviewing transcripts and entering into colleges' enterprise resource planning (ERP) systems, the challenge of trying to automate the electronic transfer of these data from K-12 to community college ERP systems, and the timing delays in transferring the data. However, the ability to rely on self-reported data enables colleges to merely collect these data at the time of placement or through the application process.

The results of this study indicate that the model selected for combining data, such as using a placement test alone, a disjunctive model, or using a conjunctive model, can have significant effects on the placement rates of students into college-level courses. Previous research (Gribbons & Meuschke, 2013 and Gribbons & Meuschke, 2013) indicated that student who had high passing grades (such as an A or B) had high pass rates in college-level English and math courses.

In addition to this study indicating that the model used for placing students can have a substantial impact on placement rates, equally important, it can reduce differential impact of placement for students from different ethnic groups.

While these results have strong implications for placement processes, such as the use of self-reported high school courses and grades and the use of disjunctive models, additional research should be conducted on placement practices once these models are implemented and results of the studies used to continue to refine the use of multiple measures to enhance student success.

References:

Gribbons, B.C. & Meuschke, D.M. (2013, June). Research Brief #59. Math Course Success Rates and Placement from High School to College. College of the Canyons: Santa Clarita, CA.

Gribbons, B.C. & Meuschke, D.M. (2013, May). Research Brief #53. English Course Section Rates from High School to College. College of the Canyons: Santa Clarita, CA.

For more detailed information on this research brief, stop by the Institutional Development and Technology office located in BONH-224, or call Daylene Meuschke, Dean of Institutional Research at 661.362.5329.