An Analytic Method for Measuring Student Academic Preparation by School and Gender

Background

An important goal for California is that public high schools continue to make progress in closing the achievement gap between demographic groups and that students are prepared for postsecondary education. Many measures could be used to inform preparation for higher education, including SAT scores, number of Advanced Placement (AP) courses offered, AP scores, standardized test scores, and completion rates of the *a–g* college preparatory curriculum.

It is not clear from the data which measures would be most suitable for gauging how students are prepared for higher education and how preparation varies between ethnic groups, between schools and between regions of California. In addition, it is not clear which measure or combination of measures would show a strong relationship with success and progress in higher education.

In early 2008 Commission staff started developing a composite measure of academic preparation based on standardized test scores in nine college preparatory subjects. Proficiency in these subjects is directly linked to the knowledge and skills that students need to acquire to be successful at the university level. Staff decided that a measure comprising multiple dimensions of preparation would be more useful in assessing school progress and success than would an assessment strategy relying on a single subject area.

Preliminary results (see table on right) indicate that the Commission's measure correlates slightly better with one-year- and two-year persistence than does the school's Academic Performance Index (API).

The Commission's measure has the advantage that it is based on data that is broken down by gender and ethnicity, so it can be used to assess how opportunities to prepare for postsecondary education vary by ethnicity and gender.

Correlation of Persistence Rates with the Commission's Composite Preparation Score and API

	Composite Preparation Score	API
California State University		
One-Year Persistence	.35	.31
Two-Year Persistence	.35	.31
University of California		
One-Year Persistence	.24	.24
Two-Year Persistence	.22	.21

The higher correlations for the Commission's Composite Preparation Score indicate that it is a better indicator of preparation for college than school API.

Commission staff analysis based on enrollment data from the Commission's Longitudinal Student Data System and school performance data from the California Department of Education.

Analysis by School and Gender

Given the Commission's interest in gender gap issues in higher education, staff investigated the validity of deriving school composite preparation scores by gender. Subject-specific proficiency scores were generated by gender for each public high school.

Page 3 shows the correlation matrices of student performance for males and females, a necessary preliminary step in deriving composite scores. As expected, student proficiency was shown to be highly correlated regardless of gender. This means, for example, that males and females who performed highly in math also performed highly in science. Similarly, males and females who performed poorly in one subject area exhibited a similar level of performance in other subject areas.

The principal component procedure used information contained in the correlation matrices to derive weights for each subject test by gender. A 2008 CPEC report, *An Analytic Method for Measuring Student Academic Preparation*, provides a technical discussion of performance weights. The gender-specific functions to determine differences between males and females in preparation for college are shown below.

For all students

> Student Preparation = .35 (Algebra I) + .36 (Geometry) + .22 (Integrated Math 2) + .34 (Algebra II)
> + .37 (World History) + .37 (Biology/Life Sciences) + .34 (Chemistry)
> + .29 (Earth Science) +.30 (Physics)

For male students

> Student Preparation = .36 (Algebra I) + .36 (Geometry) + .26 (Integrated Math 2) + .34 (Algebra II)
> + .37 (World History) + .37 (Biology/Life Sciences) + .35 (Chemistry)
> + .30 (Earth Science) +.31 (Physics)

For female students

> Student Preparation = .35 (Algebra I) + .36 (Geometry) + .24 (Integrated Math 2) + .33 (Algebra II)
> + .37 (World History) + .37 (Biology/Life Sciences) + .34 (Chemistry)
> + .30 (Earth Science) +.32 (Physics)

The table on page 4 shows the 30 schools with the highest composite preparation scores. These schools appear to be achieving a high degree of success with respect to male and female student preparation. For example, Gretchen Whitney School ranks first overall and for males and females. Lowell High School ranks second statewide, second for females, and fourth for males. Palo Alto High School ranks 16th overall, 13th for females, and 15th for males.

These results should be regarded as tentative until staff complete the preparation model and undertake more elaborate studies.

Correlation Matrices of Academic Proficiency Scores

Males

	Algebra I	Geometry	Integrated Math 2	Algebra II	World History	Biology/Life Science	Chemistry	Earth Science	Physics
Algebra I	—	0.87	0.75	0.69	0.72	0.69	0.54	0.56	0.51
Geometry	0.87	—	0.07	0.80	0.75	0.75	0.73	0.56	0.63
Integrated Math 2	0.75	0.07	—	0.14	0.50	0.58	0.49	0.36	0.48
Algebra II	0.69	0.80	0.14	—	0.68	0.66	0.70	0.48	0.63
World History	0.72	0.75	0.50	0.68	—	0.85	0.69	0.67	0.63
Biology/Life Science	0.69	0.75	0.58	0.66	0.85	—	0.71	0.67	0.61
Chemistry	0.54	0.72	0.48	0.70	0.69	0.71	—	0.52	0.61
Earth Science	0.56	0.56	0.36	0.48	0.67	0.67	0.52	—	0.52
Physics	0.50	0.63	0.48	0.63	0.63	0.61	0.61	0.52	—

A value close to -1 indicates a high negative correlation and a value close to +1 indicates a high positive correlation.

Females

	Algebra I	Geometry	Integrated Math 2	Algebra II	World History	Biology/Life Science	Chemistry	Earth Science	Physics
Algebra I	—	0.87	0.78	0.71	0.69	0.69	0.57	0.57	0.53
Geometry	0.87	—	0.15	0.80	0.75	0.77	0.73	0.58	0.65
Integrated Math 2	0.78	0.15	—	0.27	0.63	0.54	0.61	0.43	0.34
Algebra II	0.71	0.80	0.27	—	0.70	0.69	0.71	0.49	0.64
World History	0.69	0.75	0.63	0.70	—	0.85	0.72	0.65	0.63
Biology/Life Science	0.69	0.77	0.54	0.69	0.85	—	0.73	0.68	0.63
Chemistry	0.57	0.73	0.61	0.71	0.72	0.73	—	0.54	0.62
Earth Science	0.57	0.58	0.43	0.49	0.65	0.68	0.54	—	0.48
Physics	0.53	0.65	0.34	0.64	0.63	0.63	0.62	0.48	—

A value close to -1 indicates a high negative correlation and a value close to +1 indicates a high positive correlation.

Next Steps

Further analyses could include determining the extent to which composite preparation scores correlate with one-year and two-year persistence rates at CSU and UC, broken down by gender. Staff will initiate more elaborate studies once predictive validity has been established by gender.

Anomalies in the data will be investigated. Staff might also study differences in preparation by racial/ethnic group. The data may also allow assessment of how preparation for postsecondary education varies within schools. Staff will explore differences between males and females at schools performing at the top, middle, and lowest one-third. Staff will present a progress report at the Commission's June 2009 meeting.

Public High School Student Preparation Rankings

	School and state rank	Composite score	Male rank	Composite score	Female rank	Composite score
1	Gretchen Whitney High, Cerritos	222.25	1	227.88	1	218.71
2	Lowell High, San Francisco	219.12	4	207.15	2	211.74
3	Oxford Academy, Cypress	214.14	2	223.56	9	181.90
4	Mission San Jose High, Fremont	208.64	3	207.51	10	179.96
5	San Marino High	199.95	6	206.62	4	193.91
6	Saratoga High	199.83	7	200.26	3	200.21
7	Campolindo High, Moraga	195.01	5	206.68	7	182.18
8	Miramonte High, Orinda	188.17	12	187.23	5	191.66
9	Troy High, Fullerton	187.95	8	195.78	8	182.14
10	Acalanes High, Lafayette	187.12	11	188.76	6	189.56
11	Henry M. Gunn High, Palo Alto	183.85	10	189.81	18	158.43
12	Los Gatos High	177.85	9	190.46	16	166.64
13	La Cañada High	175.21	14	175.04	12	177.52
14	University High, Irvine	173.86	19	173.06	11	178.02
15	Diamond Bar High	173.29	13	182.07	50	136.97
16	Palo Alto High	172.35	15	174.13	13	171.13
17	Monta Vista High, Cupertino	171.02	16	173.89	14	168.36
18	Lynbrook High, San Jose	168.41	23	169.28	15	167.53
19	Dana Hills High, Dana Point	165.06	20	172.80	17	160.05
20	Walnut High	164.18	18	173.35	21	153.76
21	Ponderosa High, Shingle Springs	160.93	104	134.75	62	132.48
22	Los Alamitos High	159.24	21	171.59	30	146.42
23	Crescenta Valley Sr. High	158.53	27	164.35	67	129.41
24	River Valley Charter, Lakeside	158.30	26	168.33	24	149.30
25	Arcadia High	157.81	37	158.91	19	158.41
26	Foothill Technology High, Ventura	157.70	17	173.40	38	140.40
27	Monte Vista High, Danville	156.81	46	155.12	39	140.38
28	San Ramon Valley High, Danville	156.00	33	159.83	22	151.90
29	La Quinta High, Westminster	155.68	31	162.57	23	150.31
30	Mira Costa High, Manhattan Beach	155.24	24	168.88	35	142.15