Predictive Analytics: Building and Utilizing an Academic Support Index

> Berkeley City College January, 28 2015

Questions we had...

- How can we tell if our programs or interventions are actually making a difference for students?
- How can we figure out which students might struggle academically in advance so we can target them for support?
- How can we target our limited resources to the students most in need?
- How can we talk about the achievement gap without contributing to stereotype threat?
- Fundamentally, how can we become more effective with our outcomes and more efficient with our resources?

What is "predictive analytics"?

 Analyzing data and measures of past performance to make predictions of future outcomes

How we traditionally look at data...

	n=	CAHSEE Math Passing Rate 2014
All Students	753	90%
White	268	100%
Hispanic/Latino	177	86%
African American	152	75%

Disproportionality

• Students with Disabilities

-Relative Risk Ratio for African American Students in BUSD is 3.3:1

 Students with from low socio-economic homes

-55% (African American), 54% (Hispanic/Latino), and 8% (White)

- Students who are in the process of learning English
 - 61% of ELs are from Spanish speaking homes

What might our data look like if we could create "equivalent" groups?

How we traditionally look at data...

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All Students	753	90%
White	268	100%
Hispanic/Latino	177	86%
African American	152	75%

How we can begin to look at data by creating "equivalent groups"...

		CAHSEE Math
		Passing Rate
	n=	2014
All Students	753	90%
White	268	100%
Hispanic/Latino	177	86%
African American	152	75%
White	252	100%
Without Disability/EL/SED*	233	100%0

EL=English Learner SED=Socio-economically disadvantaged

Equivalent groups...

		CAHSEE Math Passing Rate
	n=	2014
All Students	753	90%
White	268	100%
Hispanic/Latino	177	86%
African American	152	75%
White Without Disability/EL/SED*	253	100%
Hispanic/Latino Without Disability/EL/SED*	66	99%

Equivalent groups...

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White Without Disability/EL/SED*	253	100%
Hispanic/Latino Without Disability/EL/SED*	66	99%
African American Without Disability/EL/SED*	53	91%

Why not continue creating equivalent groups this way?











A Different way to create more similar groups...

Adjust for differences but *keep it simple*





Protective and Risk Factors of Student Performance

Tailwinds (protective factors)

- High Parent Education Level
- Stable housing
- History of academic success
- High attendance rates



Headwinds (extra challenges)

- English Learner
- Disability
- Socio-economically Disadvantaged
- Low Parent Education Level
- Homeless
- · History of academic struggles
- Poor attendance

Demographic contributors to the Academic Support Index

Demographic Characteristic:	Points
English Learner	2
Special Education	2
Socio-Economically Disadvantaged	2
Parents are not high school graduates	2
Parents are high school graduates	1
Experiencing Education as an African American Student	1
CST Math FBB	2
CST ELA FBB	2
CST Math BB	1
CST ELA BB	1



BHS Population by ASI



Changing the Narrative

CAHSEE February 2014 Results*

	All BHS		African American			
ASI	ELA % passed	Math % passed	n	ELA % passed	Math % passed	n
0	100.00	99.71	347	-	-	0
1	95.06	96.30	83	92.59	96.30	28
2	92.22	94.51	92	94.12	82.35	17
3	86.44	90.00	62	72.73	78.26	24
4	80.95	86.89	66	86.36	86.36	22
5	56.00	54.72	57	55.17	54.84	33
6	44.12	63.64	34	52.94	70.59	17
7	20.00	47.37	21	20.00	55.56	10
8	22.22	44.44	9	16.67	50.00	6

*Includes only students who took the test in February.

Changing the narrative...

Looking at the Academic Support Index and its relationship to student outcomes...



ASI vs. Semester One 2013-14 GPA



Academic Support Index

 $R^2 = 0.8981$

ASI vs. Cumulative GPA



ASI vs. On-Track for UC Eligibility



Academic Support Index

 $R^2 = 0.9684$

ASI vs. Meeting End of 3rd Grade Reading Target



ASI Strongly Correlates to CAHSEE ELA Passing Rates Over Time

	CAHSEE ELA	CAHSEE ELA	CAHSEE ELA
Academic	PASSING RATE	PASSING RATE	PASSING RATE
Support Index	2012	2013	2014
0	100%	100%	100%
1	95%	97%	97%
2	89%	96%	91%
3	85%	88%	87%
4	79%	89%	70%
5	50%	60%	61%
6	40%	58%	55%
7	16%	39%	43%
Correlation	$R^2 = 0.90224$	$R^2 = 0.87051$	$R^2 = 0.96859$

At what point does a student become at-risk for academic underperformance?

Confidence Intervals for CAHSEE Math 2014



*Indicates range of 95% confidence interval

Confidence Intervals for Cumulative GPA vs. ASI



Inflection Points...

Cumulative GPA < 2.5 by ASI Percent Inflection Point ASI

How can we use the Academic Support Index?

- Provides context when looking at student data
- Targeting students for intervention
- Program and Intervention Evaluation
- More precise data disaggregation

Applications...

Small Learning Communities		Туре
Academic Choice	AC	Traditional Model
Arts and Humanities Academy	AHA*	California Partnership Academy
Academy of Medicine and Public Service	AMPS*	California Partnership Academy
Berkeley International High School	BIHS	International Baccalaureate
Communication Arts and Sciences	CAS*	California Partnership Academy
Green Academy	GRN*	California Partnership Academy
Context when looking at Assessment Data... (BHS 10th Grade ELA Common Assessments)

Pre-Post-Change in Learning Assessment Average Assessment Percent Community AST Mastery % Mastery % Mastery AC (Traditional HS) 41 24 AHA (CPA) AMPS (CPA) 27 **BIHS** (IB) 57 21 CAS (CPA) 29 GRN (CPA) 41 BHS Overall

Context when looking at Assessment Data... (BHS 10th Grade ELA Common Assessments)

Pre-Post-Change in Learning Assessment Average Assessment Percent Community Mastery % ASI Mastery % Mastery AC (Traditional HS) 26 41 +15AHA (CPA) 22 24 +2AMPS (CPA) 2 27 +2534 **BIHS** (IB) 57 +239 21 +12CAS (CPA) 13 29 +16GRN (CPA) 25 41 +16BHS Overall

Context when looking at Assessment Data... (BHS 10th Grade ELA Common Assessments)

Pre-Post-Change in Learning Average Assessment Assessment Percent Community ASI Mastery % Mastery % Mastery 1.78 AC (Traditional HS) 26 41 +152.65 22 24 +2AHA (CPA) AMPS (CPA) 2 27 2.85 +2534 **BIHS** (IB) 1.15 57 +232.40 9 21 +12CAS (CPA) 2.66 13 29 +16GRN (CPA) **BHS** Overall 1.96 25 41 +16

Understanding class compositions

Course	Average ASI
AC-AP-LangANDCmp(AP)	0.89
AHA-AP-LangCmp (AP)	3.38
CAS-AP-LangCmp (AP)	3.35
BHS Average	1.33

Context for looking at classes, cohorts, and interventions	Composition of our interventions	
Intervention	Average Academic Support Index	
AC-ACADEV	4.57	
AVID	2.88	
Bridge	3.84	
Rise	4.40	
Y-Scholars	3.10	
3+ ASI and No Intervention	4.80	
3+ ASI and Yes Intervention	4.54	
No Intervention	1.19	

Identifying students for intervention...

Intervention Menu



Connecting incoming 9th graders to appropriate resources



• ASI Scores

 Scored all BUSD 8th Graders on Transition Rubric

Rubric completed by teams lead by middle school counselors

	Level of Concern	No Informati on (1)	Low (2)	Medium (3)	High (4)	Extreme (5)
1	Behavioral	No Information	 Age appropriate No concerns 	 Some concerns . 	 Moderate concerns . 	 Drug and alcohol Fighting Gang membership History of discipline issues Has a Probation Officer
2	Mental Health	No information	 Age appropriate No concerns 	 Some concerns 	 Moderate concerns 	 Should immediately connect with BHS Health Center
3	Family/Ho me life	No information	 Strong home and family life No concerns 	 Some concerns . 	 Moderate concerns Minimal parent engagement 	 Homeless/McKinney-Vento Incarcerated parent Group home/Foster Loss of a parent or sibling
4	Social/Peer	No information	 Strong social skills/peer group No concerns 	 Some concerns 	 Moderate concerns 	 Makes poor choices Troubled peer group Few or no friends
5	Math Skills	No Information	 At or above grade level SBP 3 or 4 No concerns 	 Some concerns May need support 	 Moderate concerns Should participate in support opportunities 	 Significantly below grade level Has failed or repeated a math class
6	ELA Skills	No Information	 At or above grade level SBP 3 or 4 No concerns 	 Some concerns May need support 	 Moderate concerns Should participate in support opportunities 	 Significantly below grade level Has failed or repeated an English class

• ASI Scores

 Scored all BUSD 8th Graders on Transition Rubric

- Screened students by:
 - Any Score of 4 or 5 on the rubric
 - Total Score of 18 or higher from the rubric
 - ASI of 4 or higher
- Results:
 - 23 Students showed up on all three screens
 - 80 Students showed up on two screens
 - 160 Students showed up on at least one screen
 - 380 did not show up on any screen

	Total number of students with DFs at first progress report	number of students with DFs identified through the Transition Screen	Percent Identified <u>before</u> <u>school</u> <u>started</u> via the Transition Screens
Any D or F	130	75	58%

Ds or Fs	Total number of students with DFs at first progress report	Total number of students with DFs identified through the Transition Screen	Percent Identified <u>before</u> <u>school</u> <u>started</u> via the Transition Screens
Any D or F	130	75	58%
2+	68	50	74%

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Any D or F	130	75	58%
2+	68	50	74%
3+	44	38	86%

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Any D or F	130	75	58%
2+	68	50	74%
3+	44	38	86%
4+	20	18	90%

Checking to see if the students identified by the screen were actually different from the non-screened students

• Chi-squared Test

- For students getting any Ds or Fs:
 - p=0.00534
 - <1% chance that students were chosen randomly
- For students getting 4 or more Ds or Fs:
 - p=0.013002
 - 1% chance that students were chosen randomly

 The results of the chi test tell us that our methodology for identifying students for support is reliable.

Screened students by:

- Far Below Basic on writing
- ASI 3+

63 students identified

- Removed EL
- Removed IEPs
- 43 remained

	CAHSEE ELA	CAHSEE Math
Passing Rate for ASI 3+ 2013	63%	64%

	CAHSEE ELA	CAHSEE Math
Passing Rate for ASI 3+ 2013	63%	64%
Passing Rate for ASI 3+ 2014	64%	71%

	CAHSEE ELA	CAHSEE Math
Passing Rate for ASI 3+ 2013	63%	64%
Passing Rate for ASI 3+ 2014	64%	71%
Passing Rate for Intervention Cohort 2014	74%	87%

	CAHSEE ELA	CAHSEE Math
Passing Rate for ASI 3+ 2013	63%	64%
Passing Rate for ASI 3+ 2014	64%	71%
Passing Rate for Intervention Cohort 2014	74%	87%
All Students 2014	87%	90%

Program and Intervention Evaluation

Student Learning Center

Program and Intervention Evaluation

Student Learning Center



Limitations...

- The ASI score is *a* screen, not *the* screen
- The ASI should be used in conjunction with other research based screens when identifying students for interventions
- Consider it a tool, not a solution
- Data integrity

Next steps...

- 1. Protective factors?
- 2. ASI in other schools/districts?
- 3. School assignment system (Lottery)
- 4. Additional screens?
- 5. Replace CST?

"Make it Stick"

What application of the ASI resonated most with you? Explain why.	What might we learn if we used the ASI levels to compare data across schools/districts instead of "similar schools"?
What would have to change in education in order to no longer need to assign one point for "experiencing education as an African American student"?	Ask your own question.

Questions?

- Academic Support Index (ASI): contact Dave Stevens at davestevens@berkeley.net
- Or go to: academicsupportindex.blogspot.com to learn more

Demographic contributors to the Academic Support Index

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Why do students who experience education as an African American get one point?

- Cumulative impact of racial micro-aggressions
- Racialized outcomes in education
- Daily experience of racism in broader society

Limitations of the Academic Support Index

Areas for further research

- Protective factors
- ASI in other school districts
- Identify replacements for CST

What would we have to do in order to eliminate the one point for experiencing education as an African American student?

- Eliminate/reduce the cumulative impact of microaggressions
- Significantly improve the capacity of teachers to incorporate culturally relevant curriculum
- Increase the frequency of interaction between students and African American educators
- Eliminate the racialized outcomes in education
- Eliminate the racism that students experience before they walk through the door each morning
"Any exploration of the racial micro-aggressions concept must include examination of the cumulative nature of racial stereotypes and their effects. Steele and Aronson's (1995) work reveals that racial stereotypes are deeply woven into the fabric of U.S. society, yet their daily effects are often misunderstood. Specifically, Steele and Aronson examined how such stereotypes may interfere with Black students' abilities to-achieve high scores on standardized tests widely believed to measure aptitude or intelligence. Their research found that when African American college students were prompted to indicate their race before taking a Graduate Record Examination (GRE), their tests scores were significantly lower than when they were not prompted to note their race. Steele and Aronson described this phenomenon as "stereotype threat" or:

... a social-psychological predicament that can arise from widely known negative stereotypes about one's group ... the existence of such a stereotype means that anything one does or -any of one's features that conform to it make the stereotypes more plausible as a selfcharacterization in the eyes of others, and perhaps even in one's own eyes. We call this predicament stereotype threat and argue that it-is experienced, essentially, as a self-evaluative threat. (p. 797)"

Middle to High School Transition Support

- Chi Squared Tests show that the screens do identify groups that are statistically different and the null hypothesis can be rejected.
 - Students who showed up on all three screens having any DFs at progress report
 - Students who showed up on any one of the three screens having 4 or more DFs at progress report

	# with any DFs	# without any DFs	Marginal Row Totals
All three screens	13 (6.89) [5.43]	13 (19.11) [1.96]	26
All others	130 (136.11) [0.27]	384 (377.89) [0.1]	514
Marginal Column Totals	143	397	540 (Grand Total)

The Chi-square statistic is 7.7604. The P value is 0.00534. This result is significant at p < 0.05.

	# with 4+ DFs	# without 4+ DFs	Marginal Row Totals	
Any of the three screens	18 (11.26) [4.04]	142 (148.74) [0.31]	160	
All others	20 (26.74) [1.7]	360 (353.26) [0.13]	380	
Marginal Column Totals	38	502	540 (Grand Total)	

The Chi-square statistic is 6.1689. The P value is 0.013002. This result is significant at p < 0.05.

• Recognizing outliers

- Grouping students within various measures
- Inflection points within measures
- ASI at which students underperform school averages

Confidence Intervals for CAHSEE ELA 2014



*Indicates range of 95% confidence interval

Confidence Intervals for Semester Two GPA



Analysis of SLCs by grade level (Average ASI) 2013-14

Grade	AC	AHA (CPA)	AMPS (CPA)	BIHS	CAS (CPA)	GRN (CPA)	B-tech	BHS Average
9	1.51	2.07	2.93	1.44	2.43	-	-	1.80
10	1.69	2.29	3.73	1.13	2.56	-	6.20	1.93
11	2.00	2.40	3.37	1.32	2.05	3.53	4.19	2.12
12	1.99	3.46	4.31	1.55	3.28	3.83	3.81	2.51
All	1.77	2.52	3.57	1.36	2.58	3.71	4.06	2.09