

■ INTRODUCTION

It has been five years since outcomes data (course placements) related to the VC Mathematics Assessment Tests were last reviewed for predictive efficacy. This empirical re-validation study is focused on two specific areas:

- Appropriateness of Cut Scores
- Disproportionate Impact as it relates to Ethnicity

Within two years, Ventura College will be using CCCAssess for recommending placements in Mathematics courses. At that time, new validation studies will be conducted.

■ SUMMARY

Data in this study relate to:

- Students who took a VC Assessment Test between May 20, 2014 and August 31, 2015
- Students who were enrolled in one of six fall 2015 VC MATH courses

Ventura College uses **four** of the **MDTP** (Mathematics Diagnostic Testing Project) Assessment Tests:

ALG: Algebra Readiness; **EALG:** Elementary Algebra; **IALG:** Intermediate Algebra; **PCAL:** Pre-Calculus.

For some courses, scores on either of two tests are used for recommended placement in courses.

● Appropriateness of Cut Scores

In fall 2015, VC offered instruction in **20** MATH courses. The **six** highest enrolled courses are the subjects of this portion of the study. Student course outcomes (success/failure) are compared to recommended placements based on Math Assessment Test scores. The table below indicates course success rates as a function of placement – i.e., whether students were placed **in**, or **below**, the course as a result of their Math Assessment Test scores.

The *Standards, Policies and Procedures for the Evaluation of Assessment Instruments Used in the CCC* states:

As related to empirical procedures, at a minimum the data should demonstrate that individuals who score above the cut score or within the score range identified have a greater expectancy of success (e.g., appear to be more prepared for the course based on instructor ratings, or a mid-term grade, or obtaining a C grade or higher) in a specific course for which placement recommendations are made than those who score below the score or score range. (Page 22)

For all **six** MATH courses, it was found that (for at least **one** of the tests used to assess course preparedness) the success rates of students placed in the course **exceeded** the success rates of students who had been placed below the course. (Success rate is the percentage of A, B, C, and P grades divided by all grades.)

Fall 2015 Course	Math Assess Test	Placed in the Course			Placed Below the Course			Diff. in Success Rates	Are Cut Scores Adequate?
		Enrolled	Success	Success Rate	Enrolled	Success	Success Rate		
MATH V10	ALG	113	161	70.2%	80	46	57.5%	12.7	Yes
MATH V01	ALG	93	56	60.2%	96	45	46.9%	13.3	Yes
	EALG	293	143	48.8%	13	7	53.8%		
MATH V03	EALG	128	77	60.2%	86	46	53.5%	6.7	Yes
	IALG	107	81	75.7%	69	32	46.4%		
MATH V04	IALG	18	12	66.7%	59	30	50.8%	15.9	Yes
	PCAL	8	7	87.5%	15	8	53.3%		
MATH V44	IALG	13	12	92.3%	90	62	68.9%	23.4	Yes
	PCAL	15	11	73.3%	15	11	73.3%		
MATH V21A	PCAL	28	25	89.3%	29	24	82.7%	6.6	Yes

• **Disproportionate Impact as it relates to Ethnicity**

According to California Community Colleges *Matriculation/SSSP Handbook*:

For the purpose of assessment, **disproportionate impact** is when the percentage of persons from a particular racial, ethnic, gender, age, or disability group, who are directed to a particular service or course placement based on an assessment test or other measure is significantly different from the representation of that group in the population of persons being assessed, and that discrepancy is not justified by empirical evidence demonstrating that the assessment test or other measure is a valid and reliable predictor of performance in the relevant educational setting. (Chapter 2, page 2.6).

This section of the study examines Math Assessment Test placements to determine if there are any indications of disproportionate impact related to ethnicity. The table below indicates the number of assessed students by test and the numbers of assessed students who enrolled in fall 2015 Math courses.

Ventura College MDTP Assessment Tests				Assessed May 20, 2014 through August 31, 2015	Assessed and Enrolled in Fall 2015 MATH Courses	Percent Assessed and Enrolled in Fall 2015 MATH Courses
Test	Code	Description	Items			
I	ALG	Algebra Readiness	50	2,045	612	30%
II	EALG	Elementary Algebra	50	1,736	755	43%
III	IALG	Intermediate Algebra	45	1,058	516	49%
IV	PCAL	Pre-Calculus	40	373	205	55%
Totals and Average Percentage				5,212	2,088	40%

Each test is divided into **three** cut-score ranges (placement categories) and each placement category has one or more recommended MATH courses associated with it. The Ventura College “Math Assessment Information Sheet” lists recommended placements in Math courses based on these placement categories (a copy of the information sheet is attached as an appendix to this report).

A Chi Square Analysis was performed for each of the **four** VC Math Assessment Tests to determine whether ethnicity was independent of (not related to) placement category.

Test I – ALG: Algebra Readiness **Differential Placement, but No Disproportionate Impact Detected**

The total calculated Chi-Square value of **24.94** exceeds the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was differential placement in regards to ethnicity.

The success rates of three Black and 60 Hispanic students who placed *below* MATH V01 but who *enrolled in* MATH V01 were 33% and 43%, respectively. From these limited data, it does **not** appear that there were occurrences of disproportionate impact as regards ethnicity.

Test II – EALG: Elementary Algebra **Disproportionate Impact Detected**

The total calculated Chi-Square value of **53.43** exceeds the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was differential placement in regards to ethnicity.

The success rates of one Black and 54 Hispanic students who placed *below* MATH V03 but who *enrolled in* MATH V03 were 100% and 52%, respectively. From these limited data, it appears that there may have been occurrences of disproportionate impact as regards ethnicity.

Test III – IALG: Intermediate Algebra **No Disproportionate Impact Detected**

The total calculated Chi-Square value of **13.84** is below the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was no differential placement in regards to ethnicity.

Test IV – PCAL: Pre-Calculus **No Disproportionate Impact Detected**

The total calculated Chi-Square value of **8.68** falls below the tabled Chi-Square statistic of **9.49** (df = 4), which indicates that there was no differential placement in regards to ethnicity.

■ **MULTIPLE TESTS AND VALIDATION CONSIDERATIONS**

The **four** MDTP Tests used by Ventura College for Math assessment/placement are discrete and discontinuous, as compared to the English Assessment Test (CTEP) which is three separate tests taken sequentially in one sitting. The following factors need to be considered when interpreting the results of this validation study.

- (1) Students chose which one of the four tests to take, which results in 17% to 25% of students receiving a placement message that advises them to “see a Counselor” or to take the next lower test
Many of these students will then use their HS transcript to place into the desired Math class
- (2) Two MDTP tests can be used to assess/place in the same course

Additionally, only about 20% of students use an assessment test score for placement in a Math class. Many students completed the pre-requisite course at VC or took an equivalent course at another college.

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■ **MATH COURSE ENROLLMENTS AND MDTP TESTS**

The following table provides enrollment data on **fall 2015** MATH courses and the numbers of students in each course who took one/more of the **four MDTP** tests.

Fall 2015 Enrollments

This section indicates the number of enrolled students by MATH course and the number and percentage that were successful in each course.

Numbers of Students who Took MDTP Tests

This section shows the number of students in each course who took one/more MDTP tests during the period between May 20, 2014 and August 31, 2015. Highlighted cells indicate the MDTP tests that are used for assessment/placement in each course (other tests may have been taken). Several MATH courses use only one MDTP test for assessing and placing students (e.g., MATH V21A uses PCAL only). MATH V21B, V21C, V22, V23, and V90 do not use assessment test scores to determine placements. Enrollment in these courses is contingent upon satisfactory completion of the applicable pre-requisite course/s.

In this study, only the **six** MATH courses with highest enrollments had their success rates compared to the assessment test score ranges which would be used for recommending placements in the courses. The six MATH courses are: MATH V01, MATH V03, MATH V04, MATH V10, MATH V21A, and MATH V44. Course IDs for these courses are highlighted in the table.

► Note that many students who do **not** receive the MATH course placement that they desired use other measures (e.g., high school math course) to enroll in the desired MATH course.

Course ID	Fall 2015 Enrollments			Numbers of Students who Took MDTP Tests				
	Number Enrolled	Successful		Test I	Test II	Test III	Test IV	Total Students
		Count	Rate	ALG	EALG	IALG	PCAL	
MATH V01	782	381	48.7%	189	311	28	1	529
MATH V02	24	21	87.5%	4	9	5	0	18
MATH V03	828	444	53.6%	97	214	177	14	502
MATH V04	401	217	54.1%	17	45	77	23	162
MATH V05	156	80	51.3%	6	23	23	5	57
MATH V10	447	284	63.5%	246	27	12	0	285
MATH V11A	48	35	72.9%	11	5	0	0	16
MATH V12	132	73	55.3%	8	28	29	0	65
MATH V13A	49	34	69.4%	5	9	3	0	17
MATH V20	119	71	59.7%	1	10	19	35	65
MATH V21A	214	147	68.7%	0	7	18	57	82
MATH V21B	108	44	40.7%	2	0	2	18	22
MATH V21C	87	66	75.9%	0	0	0	5	5
MATH V22	46	38	82.6%	0	0	0	2	2
MATH V23	40	26	65.0%	0	0	0	0	0
MATH V35	34	29	85.3%	4	4	8	1	17
MATH V38	37	36	97.3%	1	1	3	0	5
MATH V40	37	31	83.8%	2	3	8	1	14
MATH V44	710	456	64.2%	19	57	103	36	215
MATH V46	69	49	71.0%	0	2	1	7	10
Total	4,368	2,562	58.7%	612	755	516	205	2,088

■ **COURSE SUCCESS RATES BY CUT SCORES**

- **MATH V10 – Pre-Algebra** (All students represented in this table were enrolled in MATH V10.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
I	ALG	30 – 50	MATH V01, 01A, V11A, V30	5	2	40.0%
		20 – 29	MATH V10	161	113	70.2%
		0 – 19	We strongly advise you see a Counselor	80	46	57.5%
			Total	246	161	65.4%

Discussion

Students who placed in MATH V10 achieved a substantially higher success rate than students who scored below the cut-score range – 70.2% versus 57.5%, respectively (a 12.7 point, or 22%, difference).

- **MATH V01 – Elementary Algebra** (All students represented in this table were enrolled in MATH V01.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
I	ALG	30 – 50	MATH V01, 01A, V11A, V30	93	56	60.2%
		20 – 29	MATH V10	64	30	46.9%
		0 – 19	We strongly advise you see a Counselor	32	15	46.9%
			Total	189	101	53.4%
II	EALG	25 – 50	MATH V03, V02, V03A, V12, V13A, V35	5	3	60.0%
		11 – 24	MATH V01 , V01A, V11A, V30	293	143	48.8%
		0 – 10	Take Test I	13	7	53.8%
			Total	311	153	49.2%
			Grand Total	500	254	50.8%

Discussion

ALG

Students who placed in MATH V01 achieved a substantially higher success rate than students who scored below the cut-score range – 60.2% versus 46.9%, respectively (a 13.3 point, or 28%, difference).

EALG

Students who placed in MATH V01 recorded a lower success rate than students who scored below the cut score range – 48.8% versus 53.8%, respectively (a -5.0 point, or -9%, difference). There were 293 students within the cut-score range versus 13 students who scored below the cut-score range. The difference in success rates is not significant at the .05 level as the calculated Chi Square value of **0.68** falls below the tabled Chi Square statistic of **3.84**.

Chi Square Analysis

Assessment Placement	Course Outcomes				(β) Row Totals
	Successful	Not Successful			
Placed in MATH V01	A	143	B	150	293
Score below MATH V01	D	7	E	6	13
(α) Column Totals		150		156	306(γ)

Tabled Chi Square Statistic

3.84 with df = 1

(df = (2 - 1) x (2 - 1) = 1 x 1 = 1)

Cell	Expected Frequencies				Individual Chi Squares			
	α x	β ÷	γ =	ε	(ε - λ) ² ÷ ε =	χ ²		
A	150	293	306	143.63	143.63	143	143.63	0.00
B	156	293	306	149.37	149.37	150	149.37	0.00
C	150	13	306	6.37	6.37	7	6.37	0.62
D	156	13	306	6.63	6.63	6	6.63	0.06
	Total Students			306.00	Total Chi Square			0.68

ε = Expected values λ = Actual values

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• **MATH V03 – Intermediate Algebra** (All students represented in this table were enrolled in **MATH V03**.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
II	EALG	25 – 50	MATH V03, V02, V03A, V12, V13A, V35	128	77	60.2%
		11 – 24	MATH V01, V01A, V11A, V30	80	44	55.0%
		0 – 10	Take Test I	6	2	33.3%
			Total	214	123	57.5%
III	IALG	27 – 45	MATH V04, V05, V38, V40, V44, V45	1	1	100.0%
		18 – 26	MATH V03, V02, V03A, V12, V13A, V35	107	81	75.7%
		0 – 17	Take Test II	69	32	46.4%
			Total	177	114	64.4%
Grand Total				391	237	60.6%

Discussion

EALG

Students who placed in MATH V03 achieved a modestly higher success rate than students who scored below the cut-score range – 60.2% versus 53.5%, respectively (a 6.7 point, or 13%, difference).

(Below cut-score – Students: 80 + 6 = 86; Successful: 44 + 2 = 46; Success rate: $46 \div 86 \times 100 = .535$ or 53.5%)

IALG

Students who placed in MATH V03 achieved a substantially higher success rate than students who scored below the cut-score range – 75.7% versus 46.4%, respectively (a 29.3 point, or 63%, difference).

• **MATH V04 – College Algebra** (All students represented in this table were enrolled in **MATH V04**.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
III	IALG	27 – 45	MATH V04, V05, V38, V40, V44, V45	18	12	66.7%
		18 – 26	MATH V03, V02, V03A, V12, V13A, V35	31	20	64.5%
		0 – 17	Take Test II	28	10	35.7%
			Total	78	42	53.8%
IV	PCAL	26 – 40	MATH V21A, V52, CS V17	0	--	--
		18 – 25	MATH V04, V05, V20, V 38, V40, V44, V45, V46	8	7	87.5%
		0 – 17	Take Test III	15	8	53.3%
			Total	23	15	65.2%
Grand Total				101	57	56.4%

Discussion

IALG

Students who placed in MATH V04 achieved a substantially higher success rate than students who scored below the cut-score range – 66.7% versus 50.8%, respectively (a 15.9 point, or 31%, difference).

(Below cut-score – Students: 31 + 28 = 59; Successful: 20 + 10 = 30; Success rate: $30 \div 59 \times 100 = .508$ or 50.8%)

PCAL

Students who placed in MATH V04 achieved a substantially higher success rate than students who scored below the cut-score range – 87.5% versus 53.3%, respectively (a 34.2 point, or 64%, difference).

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● **MATH V44 – Elementary Statistics** (All students represented in this table were enrolled in **MATH V44**.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
III	IALG	27 – 45	MATH V44, V04, V05, V38, V40, V45	13	12	92.3%
		18 – 26	MATH V03, V02, V03A, V12, V13A, V35	38	27	71.1%
		0 – 17	Take Test II	52	35	67.3%
			Total	103	74	71.8%
IV	PCAL	26 – 40	MATH V21A, V52, CS V17	6	5	83.3%
		18 – 25	MATH V44, V04, V05, V20, V38, V40, V45, V46	15	11	73.3%
		0 – 17	Take Test III	15	11	73.3%
			Total	36	27	75.0%
Grand Total				139	101	72.7%

Discussion

IALG

Students who placed in MATH V44 achieved a substantially higher success rate than students who scored below the cut-score range – 92.3% versus 68.9%, respectively (a 23.4 point, or 34%, difference).

(Below cut-score – Students: 38 + 52 = 90; Successful: 27 + 35 = 62; Success rate: $62 \div 90 \times 100 = .689$ or 68.9%)

PCAL

The success rate for students who placed in MATH V44 was the same as for students who scored below the cut-score range – 73.3% for each group (a 0.0 point, or 0%, difference).

● **MATH V21A – Calculus with Analytic Geometry I** (All students represented in this table enrolled in **MATH V21A**.)

Assessments		Cut Scores	Recommended Courses	Total Students	Successful	Success Rate
Test	Code					
IV	PCAL	26 – 40	MATH V21A, V52, CS V17	28	25	89.3%
		18 – 25	MATH V04, V05, V20, V38, V40, V44, V45, V46	15	14	93.3%
		0 – 17	Take Test III	14	10	71.4%
			Total	57	49	86.0%

Discussion

Students who placed in MATH V21A achieved a modestly higher success rate than students who scored below the cut-score range – 89.3% versus 82.7%, respectively (a 6.6 point, or 8%, difference).

(Below cut-score – Students: 15 + 14 = 29; Successful: 14 + 10 = 24; Success rate: $24 \div 290 \times 100 = .827$ or 82.7%)

■ **RECOMMENDED PLACEMENTS BY ETHNICITY**

● **Test I – ALG: Algebra Readiness**

Ethnic Groups		ALG Test Scores	30 – 50	20 – 29	0 – 19
		MATH Course Placements	V01, V01A, V11A, V30	V10	Advised to see Counselor
Code	Description	Number Taking Test	Placement Percentages	Placement Percentages	Placement Percentages
A	Asian	20	35%	45%	20%
B	Black or African-American	13	15%	46%	38%
H	Hispanic	358	23%	51%	26%
N	Native American	1	--	100%	--
P	Pacific Islander	1	--	100%	--
T	Multi-Ethnic	21	38%	38%	24%
W	White	194	42%	41%	17%
X	Unreported	4	25%	75%	--
Total and Average Percentages		612	30%	48%	22%
Total Numbers of Students		612	182	291	139

Discussion

Because three of the Ethnic Groups had very low representation, they were omitted from the analysis. The five ethnic groups highlighted in yellow were evaluated for disproportionate impact using the Chi-Square Test. The total calculated Chi-Square value of **24.94** exceeds the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was differential placement in regards to ethnicity.

See Differential Placement, Test I – ALG: Algebra Readiness on page 12.

Chi Square Analysis

Ethnic Groups	Recommended Placements						(β) Row Totals	
	V01, etc.		V10		See Counselor			
Asian	A	7	B	9	C	4	20	
Black or African-American	D	2	E	6	F	5	13	
Hispanic	G	83	H	183	I	92	358	
Multi-Ethnic	J	8	K	8	L	5	21	
White	M	81	N	80	O	33	194	
(α) Column Totals		181		286		139		606 (γ)

Tabled Chi Square Statistic

15.51 with df = 8

(df = (5 - 1) x (3 - 1) = 4 x 2 = 8)

Cell	Expected Frequencies				Individual Chi Squares				Ethnic Groups	λ ÷ ε	MATH V01 placements lower than expected
	α	x	β	÷	γ	=	ε	(ε - λ) ² ÷ ε = χ ²			
A	181	20	606	5.97	5.97	7	5.97	0.18	Asian	1.17	
B	286	20	606	9.44	9.44	9	9.44	0.21			
C	139	20	606	4.59	4.59	4	4.59	0.08			
D	181	13	606	3.88	3.88	2	3.88	0.91	Black	0.51	Actual MATH V01 placements were <u>51%</u> of expected placements
E	286	13	606	6.14	6.14	6	6.14	0.00			
F	139	13	606	2.98	2.98	5	2.98	1.37			
G	181	358	606	106.93	106.93	83	106.93	5.36	Hispanic	0.77	Actual MATH V01 placements were <u>77%</u> of expected placements
H	286	358	606	168.96	168.96	183	168.96	1.17			
I	139	358	606	82.12	82.12	92	82.12	1.19			
J	181	21	606	6.27	6.27	8	6.27	0.48	Multi-Eth	1.28	
K	286	21	606	9.91	9.91	8	9.91	0.37			
L	139	21	606	4.82	4.82	5	4.82	0.01			
M	181	194	606	57.94	57.94	81	57.94	9.18	White	1.40	
N	286	194	606	91.56	91.56	80	91.56	1.46			
O	139	194	606	44.50	44.50	33	44.50	2.97			
Total Students		606.01		Total Chi Square		24.94		ε = Expected values λ = Actual values			

• **Test II – EALG: Elementary Algebra**

Ethnic Groups Code Description		EALG Test Scores	25 – 50	11 – 24	0 – 10
		MATH Course Placements	V02, V03, V12, V13A, V35	V01, V11A, V30	Take Test I
		Number Taking Test	Placement Percentages	Placement Percentages	Placement Percentages
A	Asian	22	55%	41%	5%
B	Black or African-American	16	19%	44%	38%
H	Hispanic	483	26%	68%	6%
N	Native American	2	0%	100%	0%
P	Pacific Islander	0	--	--	--
T	Multi-Ethnic	26	50%	42%	8%
W	White	201	38%	59%	3%
X	Unreported	5	60%	40%	0%
Total and Average Percentages		755	31%	63%	6%
Total Numbers of Students		755	232	478	45

Discussion

Because three of the Ethnic Groups had very low representation, they were omitted from the analysis. The five ethnic groups highlighted in yellow were evaluated for disproportionate impact using the Chi-Square Test. The total calculated Chi-Square value of **53.43** exceeds the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was differential placement in regards to ethnicity.

See Differential Placement, Test II – EALG: Algebra Readiness on page 12.

Chi Square Analysis

Ethnic Groups	Recommended Placements						(β) Row Totals
	V03, etc.		V01, etc.		Take Test I		
Asian	A	12	B	9	C	1	22
Black or African-American	D	3	E	7	F	6	16
Hispanic	G	124	H	329	I	30	483
Multi-Ethnic	J	13	K	11	L	2	26
White	M	77	N	118	O	6	201
(α) Column Totals		229	474	45			748 (γ)

Tabled Chi Square Statistic

15.51 with df = 8
(df = (5 - 1) x (3 - 1) = 4 x 2 = 8)

Cell	Expected Frequencies				Individual Chi Squares				Ethnic Groups	λ ÷ ε	MATH V03 placements lower than expected	
	α x	β ÷	γ =	ε	(ε - λ) ² ÷ ε =	χ ²						
A	229	22	748	6.74	6.74	12	6.74	4.10	Asian	1.78		
B	474	22	748	13.94	13.94	9	13.94	1.75				
C	45	22	748	1.32	1.32	1	1.32	0.77				
D	229	16	748	4.90	4.90	3	4.90	0.74	Black	0.61	Actual MATH V03 placements were <u>61%</u> of expected placements	
E	474	16	748	10.14	10.14	7	10.14	0.97				
F	45	16	748	0.96	0.96	6	0.96	26.46				
G	229	483	748	147.87	147.87	124	147.87	3.85	Hispanic	0.84	Actual MATH V03 placements were <u>84%</u> of expected placements	
H	474	483	748	306.07	306.07	329	306.07	1.72				
I	45	483	748	29.06	29.06	30	29.06	0.30				
J	229	26	748	7.96	7.96	13	7.96	3.19	Multi-Eth	1.63		
K	474	26	748	16.47	16.47	11	16.47	1.82				
L	45	26	748	1.56	1.56	2	1.56	0.12				
M	229	201	748	61.54	61.54	77	61.54	3.88	White	1.25		
N	474	201	748	127.37	127.37	118	127.37	0.69				
O	45	201	748	12.09	12.09	6	12.09	3.07				
Total Students		747.99	Total Chi Square		53.43	ε = Expected values		λ = Actual values				

• **Test III – IALG: Intermediate Algebra**

Ethnic Groups		IALG Test Scores	27 – 45	18 – 26	0 – 17
		MATH Course Placements	V04, V05, V38, V40, V44, V45	V02, V03, V03A, V12, V13A, V35	Take Test II
		Number Taking Test	Placement Percentages	Placement Percentages	Placement Percentages
Code	Description				
A	Asian	23	22%	35%	43%
B	Black or African-American	18	0%	39%	61%
H	Hispanic	308	9%	41%	50%
N	Native American	1	--	--	100%
P	Pacific Islander	0	--	--	--
T	Multi-Ethnic	23	9%	43%	48%
W	White	141	15%	48%	37%
X	Unreported	2	50%		50%
Total and Average Percentages		516	11%	42%	47%
Total Numbers of Students		516	57	219	240

Discussion

Because three of the Ethnic Groups had very low representation, they were omitted from the analysis. The five ethnic groups highlighted in yellow were evaluated for disproportionate impact using the Chi-Square Test. The total calculated Chi-Square value of **13.84** is below the tabled Chi-Square statistic of **15.51** (df = 8), which indicates that there was no differential placement in regards to ethnicity.

Chi Square Analysis

Ethnic Groups	Recommended Placements			(β) Row Totals
	V04, V44, etc.	V03, etc.	Take Test II	
Asian	A 5	B 8	C 10	23
Black or African-American	D 0	E 7	F 11	18
Hispanic	G 28	H 126	I 154	308
Multi-Ethnic	J 2	K 10	L 11	23
White	M 21	N 68	O 52	141
(α) Column Totals	56	219	238	513 (γ)

Tabled Chi Square Statistic

15.51 with df = 8
(df = (5 - 1) x (3 - 1) = 4 x 2 = 8)

Cell	Expected Frequencies				Individual Chi Squares				Ethnic Groups	λ ÷ ε	MATH V04 placements lower than expected
	α x	β ÷	γ =	ε	(ε - λ) ² ÷ ε =	χ ²					
A	56	23	513	2.51	2.51	5	2.51	2.47	Asian	1.99	
B	219	23	513	9.82	9.82	8	9.82	0.34			
C	238	23	513	10.67	10.67	10	10.67	0.04			
D	56	18	513	1.96	1.96	0	1.96	1.96	Black	0.0	Actual MATH V04 placements were <u>0%</u> of expected placements
E	219	18	513	7.68	7.68	7	7.68	0.06			
F	238	18	513	8.35	8.35	11	8.35	0.84			
G	56	308	513	33.62	33.62	28	33.62	0.94	Hispanic	0.83	Actual MATH V04 placements were <u>83%</u> of expected placements
H	219	308	513	131.48	131.48	126	131.48	0.23			
I	238	308	513	142.89	142.89	154	142.89	0.96			
J	56	23	513	2.51	2.51	2	2.51	0.10	Multi-Eth	0.80	Actual MATH V04 placements were <u>80%</u> of expected placements
K	219	23	513	9.82	9.82	10	9.82	0.00			
L	238	23	513	10.67	10.67	11	10.67	0.10			
M	56	141	513	15.39	15.39	21	15.39	2.04	White	1.36	
N	219	141	513	60.19	60.19	68	60.19	1.01			
O	238	141	513	65.41	65.41	52	65.41	2.75			
Total Students		512.97	Total Chi Square		13.84	ε = Expected values		λ = Actual values			

● **Test IV – PCAL: Pre-Calculus**

Ethnic Groups		PCAL Test Scores	26 – 40	18 – 25	0 – 17
		MATH Course Placements	V21A, V52, CS V17	V04, V05, V20, V38, V40, V44 V45, V46A	Take Test III
Code	Description	Number Taking Test	Placement Percentages	Placement Percentages	Placement Percentages
A	Asian	28	43%	18%	39%
B	Black or African-American	2	--	--	100%
H	Hispanic	113	19%	32%	49%
N	Native American	1	--	100%	--
P	Pacific Islander	0	--	--	--
T	Multi-Ethnic	2		50%	50%
W	White	58	24%	38%	38%
X	Unreported	1	--	--	100%
Total and Average Percentages		205	23%	32%	45%
Total Numbers of Students		205	48	65	92

Discussion:

Because five of the Ethnic Groups had very low representation, they were omitted from the analysis. The three ethnic groups highlighted in yellow were evaluated for disproportionate placement using the Chi-Square Test. The total calculated Chi-Square value of **8.68** falls below the tabled Chi-Square statistic of **9.49** (df = 4), which indicates that there was no differential placement in regards to ethnicity.

Chi Square Analysis

Ethnic Groups	Recommended Placements			(β) Row Totals			
	V21A, etc.	V04, V44, etc.	Take Test III				
Asian	A	12	B	5	C	11	28
Hispanic	D	22	E	36	F	55	113
White	G	14	H	22	I	22	58
(α) Column Totals		48	63	88	199 (γ)		

Tabled Chi Square Statistic

9.49 with df = 4
(df = (3 - 1) x (3 - 1) = 2 x 2 = 4)

Cell	Expected Frequencies				Individual Chi Squares				Ethnic Groups	λ ÷ ε	MATH V21A placements lower than expected
	α	x	β	÷ γ = ε	(ε - λ) ² ÷ ε = χ ²	ε	λ	χ ²			
A	48	28	199	6.75	6.75	12	6.75	4.08	Asian	1.78	
B	63	28	199	8.86	8.86	5	8.86	1.68			
C	88	28	199	12.38	12.38	11	12.38	0.15			
D	48	113	199	27.26	27.26	22	27.26	1.02	Hispanic	0.81	Actual MATH V21A placements were 81% of expected placements
E	63	113	199	35.77	35.77	36	35.77	0.00			
F	88	113	199	49.97	49.97	55	49.97	0.51			
G	48	58	199	13.99	13.99	14	13.99	0.00	White	1.00	
H	63	58	199	18.36	18.36	22	18.36	0.72			
I	88	58	199	25.65	25.65	22	25.65	0.52			
Total Students		198.99	Total Chi Square		8.68	ε = Expected values		λ = Actual values			

■ **DIFFERENTIAL PLACEMENT**

● **Test I – ALG: Algebra Readiness**

The **ALG** Test is used to assess student preparation for placement in the **lowest** level math classes:

<u>Score Range</u>	<u>Recommendation</u>
30 – 50	MATH V01 – Elementary Algebra, etc.
20 – 29	MATH V10 – Pre-Algebra
0 – 19	Advised to see a Counselor

MATH V01 is the highest recommendation available to a student taking the **ALG**. As such, this evaluation is concerned with determining whether there might be disproportionate impact based on ethnicity related to **MATH V01** placement recommendations.

The Chi Square Analysis related to the **ALG** (page 8) indicated that **Black** and **Hispanic** students may have been disproportionately recommended to placement in MATH V10 or to “see a Counselor.” In the table below, success rates were calculated for students who took the ALG, placed below MATH V01, but took MATH V01.

Ethnic Group	Enrolled	Successful	Success Rate	Unsuccessful Percentage
Asian	2	2	100.0%	0.0%
Black	3	1	33.3%	66.7%
Hispanic	60	26	43.3%	56.7%
Multi-Ethnic	2	0	0.0%	100.0%
White	29	16	55.2%	44.8%
Total	96	45	46.9%	53.1%

Of the **three Black** students took **MATH V01**, only **33%** were successful; of the **60** Hispanic students who enrolled in **MATH V01**, only **43%** were successful. From these limited data, it does **not** appear that there were occurrences of disproportionate impact as regards ethnicity.

● **Test II – EALG: Elementary Algebra**

The **EALG** Test is used to assess student preparation for placement in **pre-collegiate** level math classes:

<u>Score Range</u>	<u>Recommendation</u>
25 – 50	MATH V03 – Intermediate Algebra, etc.
11 – 24	MATH V01 – Elementary Algebra, etc.
0 – 10	Take Test I

MATH V03 is the highest recommendation available to a student taking the **EALG**. As such, this evaluation is concerned with determining whether there might be disproportionate impact based on ethnicity related to **MATH V03** placement recommendations.

The Chi Square Analysis related to the **EALG** (page 9) indicated that **Black** and **Hispanic** students may have been disproportionately recommended to placement in MATH V10 or to “Take Test I.” In the table below, success rates were calculated for students who took the EALG, placed below MATH V03, but took MATH V03.

Ethnic Group	Enrolled	Successful	Success Rate	Unsuccessful Percentage
Asian	4	4	100.0%	0.0%
Black	1	1	100.0%	0.0%
Hispanic	54	28	51.9%	48.1%
Multi-Ethnic	6	2	33.3%	66.7%
White	21	11	52.4%	47.6%
Total	86	46	53.5%	46.5%

The **one Black** student who enrolled **MATH V03** was successful; of the **54** Hispanic students who enrolled in **MATH V03**, **52%** were successful. From these limited data, it appears that there **may** have been occurrences of disproportionate impact as regards ethnicity.



Information Sheet
MATH ASSESSMENT
 Ventura College Assessment Office - (805) 289-6402

The intent of assessment testing is to help you determine the course(s) most appropriate for you, based on your skill level.

Assessment test Instrument: Mathematics Diagnostic Testing Program (MDTP)

TEST I / ALGEBRA READINESS: 50 Questions / 60 Minutes	
SCORE	RECOMMENDED COURSES
30 – 50	MATH V01, V01A, V11A, V30
20 – 29	MATH V10
0 – 19	We strongly advise you see a Counselor

TEST II / ELEMENTARY ALGEBRA: 50 Questions / 60 Minutes	
SCORE	RECOMMENDED COURSES
25 – 50	MATH V02, V03, V03A, V12, V13A, V35
11 – 24	MATH V01, V01A, V11A, V30
0 – 10	Take Test I

TEST III / INTERMEDIATE ALGEBRA: 45 Questions / 60 Minutes	
SCORE	RECOMMENDED COURSES
27 – 45	MATH V04, V05, V38, V40, V44, V45
18 – 26	MATH V02, V03, V03A, V12, V13A, V35
0 – 17	Take Test II

TEST IV / PRE-CALCULUS: 40 Questions / 60 Minutes	
SCORE	RECOMMENDED COURSES
26 – 40	CSV17; MATH V21A, V52
18 – 25	MATH V04, V05, V20, V38, V40, V44, V45, V46A
0 – 17	Take Test III

NOTE:

Students who score at the lower end of any score range are encouraged to enroll in a course at the next lower level to improve chances for success. Students who have not taken a math course in the past two (2) years are also encouraged to enroll in a course at the next lower level.

Students with learning disabilities, or those experiencing learning difficulties, may contact the Educational Assistance Center (EAC) for additional information at (805) 289-6300.