Achievement Gaps in Developmental Studies in Mathematics: A View of Community College Students

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Why Concentrate on Mathematics?

"Of all pre-college curricula, the highest level of mathematics one studies in secondary school has the strongest continuing influence on bachelors degree completion. Finishing a course beyond the level of Algebra 2 more than doubles the odds that a student who enters postsecondary education will complete a bachelors degree. (Adelman, 1999; 2006)

Table 14. First institution of attendance of 12th-graders from the high school classes of 1982, and 1992 who entered postsecondary education at any time following the year in which they were scheduled to graduate from high school, by highest level of mathematics studied in high school

Institution of first attendance	Highest level of mathematics studied in high school			
	Calculus or precalculus	Trigo-nometry	Algebra 2	Less than algebra 2
Four-year college				
Class of 1982	21.9 (1.08)	16.3 (0.94)	30.7 (1.23)	31.1 (1.15)
Class of 1992	40.0 (1.48)	18.4 (1.21)	30.2 (1.29)	11.4 (1.27)
Community college				
Class of 1982	3.9 (0.47)	7.5 (0.74)	25.3 (1.19)	63.2 (1.35)
Class of 1992	7.6 (0.90)	11.9 (1.84)	37.0 (2.61)	43.5 (2.24)
Other sub-baccalaureate				
Class of 1982	0.9 (0.50)	2.3 (0.64)	22.8 (2.24)	73.9 (2.35)
Class of 1992	5.2 (1.65)	4.7 (1.13)	31.1 (4.45)	58.9 (4.25)

Why Focus on Community Colleges? Demographics

- **Total of 1,202 Colleges**
  - 991 Public
  - 31 Tribal Colleges
- **Enrollment**
  - 60% of students attend part time
- **Demographics**
  - Average age 29 years
  - Women – 59%
  - People of color – 34%
  - First-generation – 39%
- **46% of ALL undergraduates**
  - First-time freshmen - 45%
  - Native American - 57%
  - Asian/Pacific Islander - 47%
  - African American - 47%
  - Hispanic - 55%

(AACC, 2007)

What Are Achievement Gaps?

- Differences in success between groups of students often measured by socio-economic status, racial identity, gender, or other demographic.
  - College admissions
    - Institutional type
  - College attendance
    - Overall
    - Full-time versus part-time
  - College retention
  - Academics
    - Placement
    - GPA or other academic progress measure
  - Graduation rates/ transfer rates

Table 1. Number of degree-granting institutions that enrolled freshmen, and the percent of those institutions that offered remedial reading, writing, or mathematics courses, by institutional type: Fall 1995 and 2000

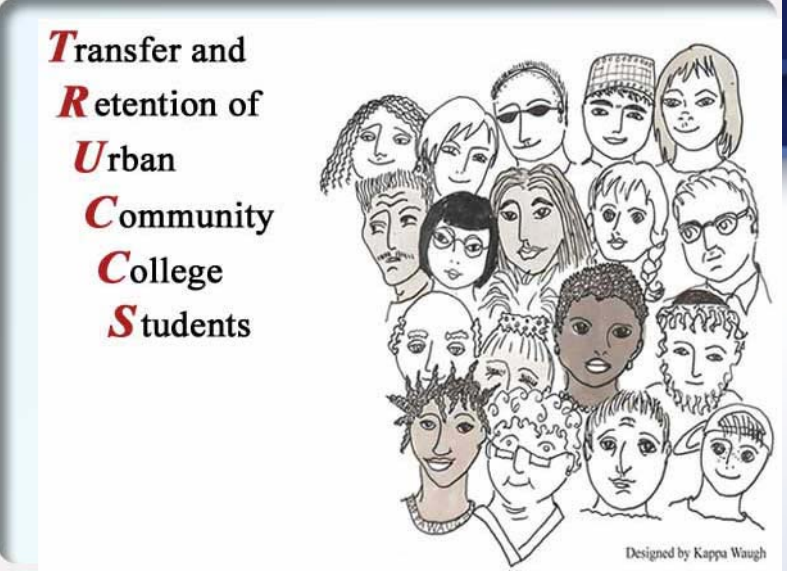
Year and institutional type	Number of degree-granting institutions with freshmen	Percent of institutions that offered remedial courses in:			
		Reading, writing, or mathematics	Reading	Writing	Mathematics
2000					
All institutions	3,230	76	56	68	71
Public 2-year	1,080	98	96	96	97
Private 2-year	270	63	37	56	62
Public 4-year	580	80	49	67	78
Private 4-year	1,300	59	30	46	49
1995					
All institutions	2,990	77	57	71	72
Public 2-year	940	100	99	99	99
Private 2-year	330	64	30	62	62
Public 4-year	540	80	52	71	78
Private 4-year	1,180	62	33	52	50

NOTE: Data reported for fall 2000 are based on Title IV degree-granting institutions that enrolled freshmen in fall 2000. Data reported for fall 1995 are based on degree-granting institutions that enrolled freshmen in fall 1995. The numbers of institutions have been rounded to the nearest 10.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Postsecondary Education Quick Information System, "Survey on Remedial Education in Higher Education Institutions: Fall 1995," 1995; and "Survey on Remedial Education in Higher Education Institutions: Fall 2000," 2001.

Enrollment in Remedial Mathematics (NCES, 2007)

- 34% of first-time community college students
- 18% of first-time 4-year college students
- Proportion of students requiring remediation is increasing
  - Especially at community colleges
- About three-quarters of the students enrolled in remedial reading, writing or mathematics courses pass or successfully complete those courses.
- For remedial mathematics, completion was lower in public 2-year institutions (66%).
- Enrollment is NOT the same as placement
- Many students not included in the statistic
  - Basic skills
  - Not “first-time”
- Averages mask dramatic differences between campuses and demographic groups



U.S. Department of Education
Office of Educational Research and Improvement
Washington, DC 20208
Grant # (R305T00015)

Lumina Foundation (1415)

Transfer and Retention of Urban Community College Students (TRUCCS)

http://www.truccs.org

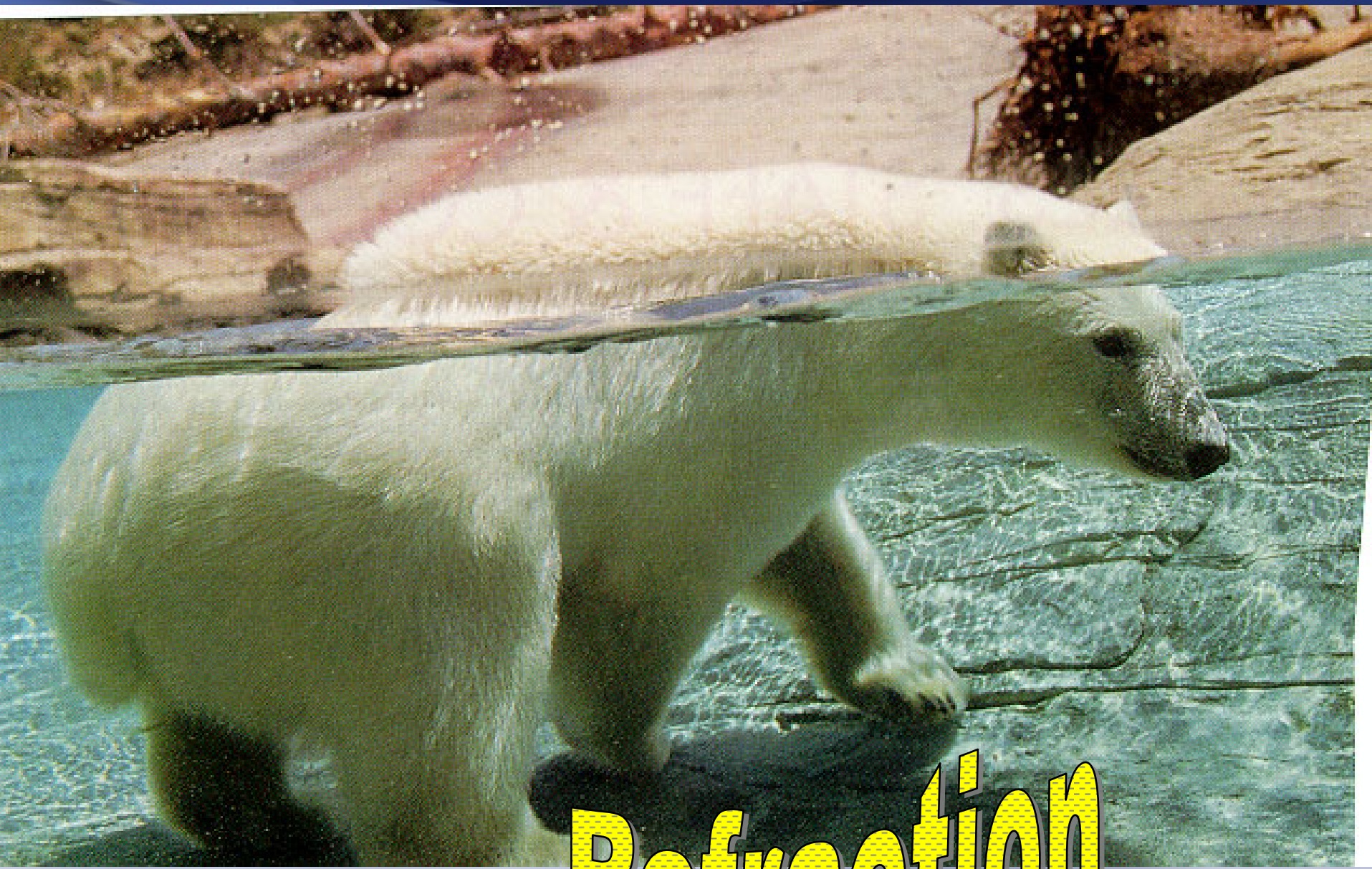
What is TRUCCS?

- 5-year longitudinal study of 5,000 community college students at the Los Angeles Community College District

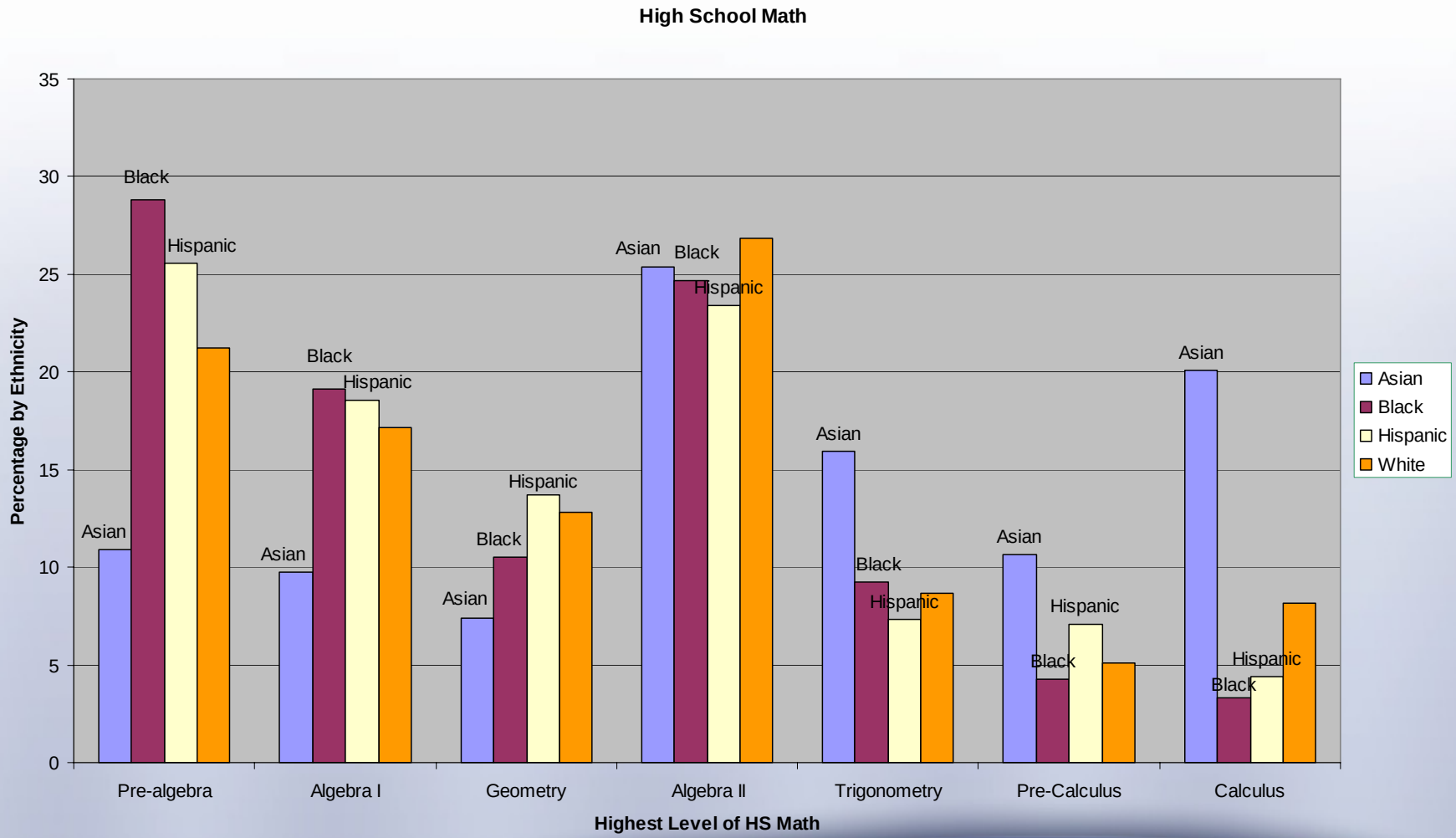
1. Qualitative (focus groups)

2. Quantitative (questionnaires)
   - Four collection points
     - 2001, 2002, 2004, 2005

3. Transcript analyses (transcripts)


Refraction

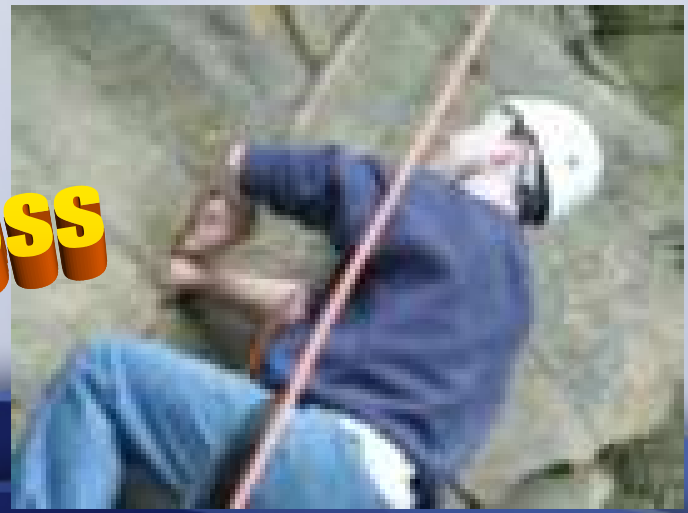
High School Mathematics



Developmental Climb

- Progressing from one level of developmental math and English to the next
- Progressing from developmental to transfer level

Community College Success



Remediation Levels

- **Level 0**: No pre-requisites exist to enter the course and the course is designed to teach the students the necessary skills to be successful in level 1 courses and beyond.
- **Level 1:** There may be a pre-requisite to join the course and the course is designed at a basic skills level, aiding the student to master the basic skills needed to be successful in the advanced level courses
- **Level 2:** A pre-requisite exists to enroll in the course and the course is beyond the basic understanding of the core concepts. Usually the course itself is indicated with the title of intermediate. However, the course does not provide transfer credit to either the University of California or California State University systems, so is not at the advanced transfer level.
- **Level 3:** The course provides transfer credits and is considered a college-level course.

Mathematics Placement Gap

96.1% of all students who took the math placement test were placed in at least one level below college level

- Placed at the LOWEST level
  - 23.1% of Asians
  - 67.3% of African Americans
  - 59.1% of Hispanics
  - 36.5% of Caucasians
  - 43.7% of Mixed Race
- Placed at the TRANSFER Level
  - 13.2% of Asians
  - 1.2% of African Americans
  - 1.6% of Hispanics
  - 9.0% of Caucasians
  - 4.0% Mixed Race

Time Removed

Math Success I

	Attempts		Passing at least one of the courses attempted at that level
	District		**District**
Level 0 Math (Remedial)	1784		1362 (76.3%)
Level 1 Math (Basic)	2195		1578 (71.9%)
Level 2 Math (Intermediate)	1581		1147 (72.5%)
Level 3 Math (Transfer)	1365		1040 (76.2%)

Different lens

Math Success II

	Average success ratio (SD) in each area attempted	Successful Progress to next level
	District	**District**
Level 0 Math (Remedial)	.66 (.42)	43.9%
Level 1 Math (Basic)	.59 (.43)	35.2%
Level 2 Math (Intermediate)	.64 (.44)	37.1%
Level 3 Math (Transfer)	.64 (.42)	

Hispanic Students Math Developmental Climb

	Attempted Level 0	Passed Level 0	Attempted Level 1	Passed Level 1	Attempted Level 2	Passed Level 2	Attempted Level 3	Passed Level 3
Group 0	607	490 (80.7%)	396 (65.2%)	313 (51.6%)	230 (37.9%)	185 (30.8%)	134 (22.1%)	105 (17.3%)
Group 1	--	--	349	281 (80.5%)	220 (63.0%)	173 (49.6%)	137 (39.3%)	112 (32.1%)
Group 2	--	--	--	--	137	110 (80.3%)	96 (70.1%)	81 (59.1%)
Group 3	--	--	--	--	--	--	64	52 (81.3%)
Totals (Total Pass Rate)	607	490 (80.7%)	718	594 (82.7%)	587	468 (79.7%)	431	350 (81.2%)

Math Success Ratio

Asian	69.0%
African American	48.6%
Hispanic	56.4%
White	64.8%

Why is College Math Important?

- Required for an AA degree
- Required for transfer

	Full sample	Males	Females	African Americans	Asians	Whites	Hispanics
Math Module	949 (28.6%)	378 (28.1%)	571 (29.0%)	99 (21.2%)	188 (47.4%)	98 (27.3%)	441 (26.5%)

Critical Mass

Does It Matter?

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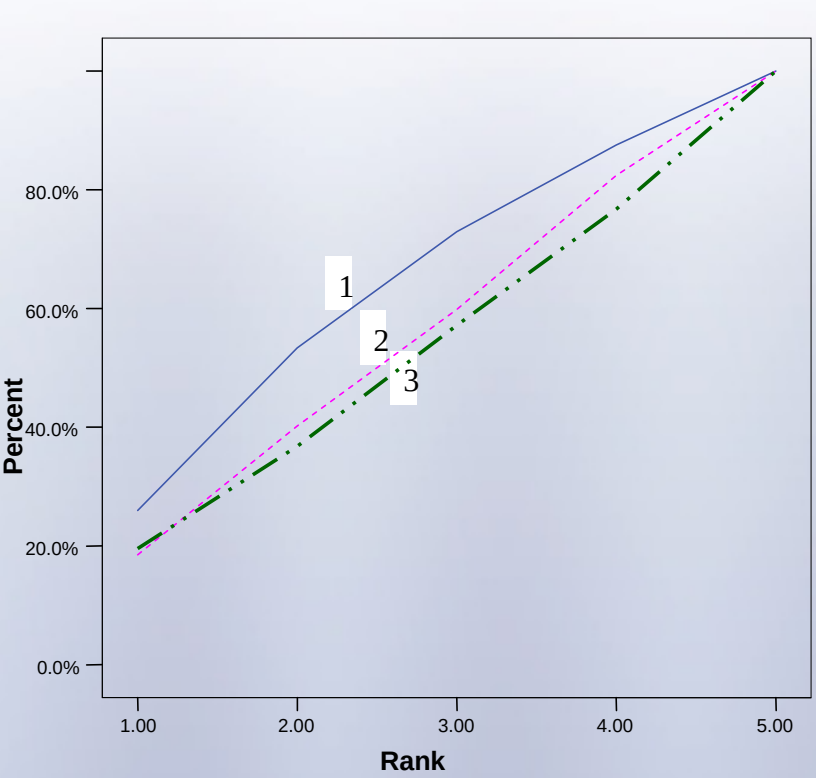
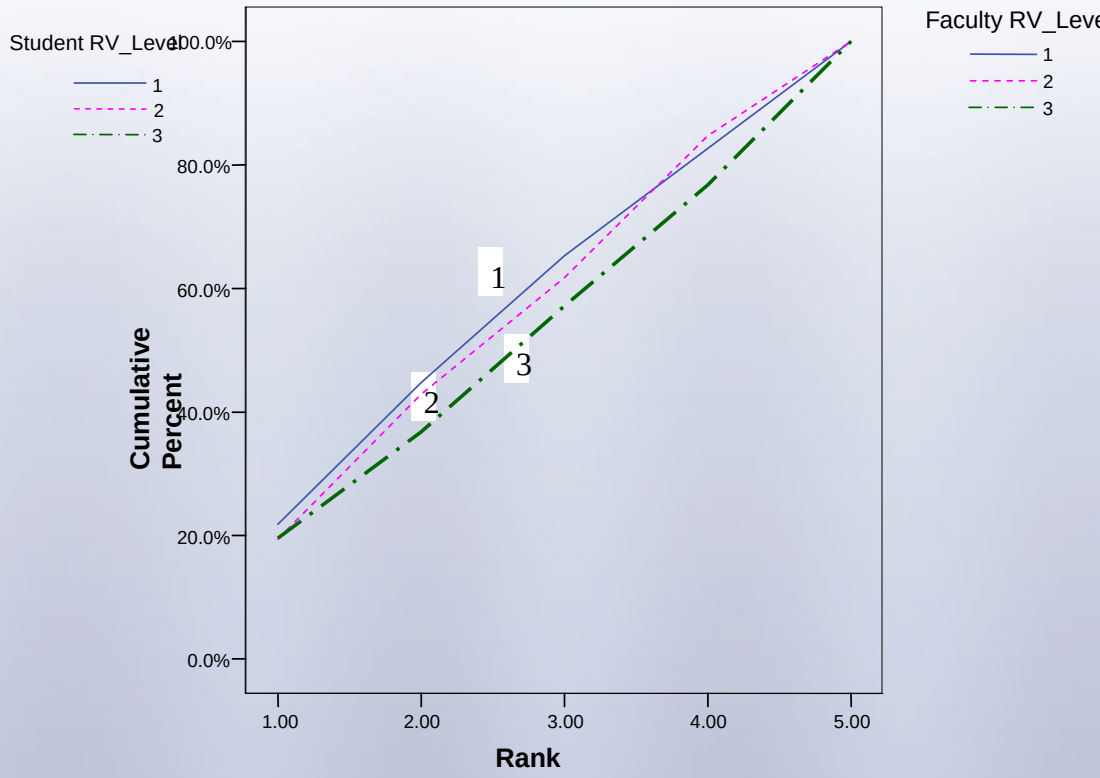
Representation Value (RV)





Hagedorn, Chi, and McLain (2007)

RV Level	Sample	English				Math			
		% not enrolled in any English	English Lowest		English Highest	% not enrolled in any Math	Math Lowest		Math Highest
			% remedial	% basic /Intermediate	%transfer level		% remedial	% basic /intermediate	% transfer level math
HRV (3)	1,226	8.2	27.6	55	55.4	15.0	44.7	36.2	31.2
MRV(2)	774	5.7	30.2	57.8	61.2	17.2	52.5	26.1	19.0
LRV(1)	281	12.8	35.2	46.6	47.3	21.7	43.8	32.4	13.2

Conclusions

- Legislators have been highly critical of remedial college courses
  - Duplication of services appropriately supported at the high school level (Hoyt and Sorenson, 2001; Kirst, 1997; Lazarick, 1997).
  - Students may be stigmatized and possibly demoralized by enrollment in developmental coursework (Boylan and Bonham, 1994)
- Legislators, administrators and educators have been unable to recommend an alternative
  - Some students DO remediate!
  - There is evidence that for those students who climb the developmental ladder, bachelor's degree attainment is possible
- Community college is a "late fix"

Policy

- It is inappropriate and ineffective to depend on community colleges to remediate students who desire to go to college but have not become college-ready.
- Community colleges must re-evaluate methods of developing students in mathematics
  - Work with high schools
  - Summer bridge
- Emphasis on monitoring of success and establishing milestones
- Face hard questions regarding attitudes and treatment of non-traditional groups.

Policy Ideas

- Students can drop and re-enroll at will.
  - Can we at least ask them why?
- Students allow long time intervals between steps.
  - Can we encourage them to be contiguously enrolled?
- Students do not understand the relationship and importance of math.
  - Can we tell them?
- Students fear math
  - Can we de-mystify it?
    - Non-graded
    - Applied
    - Learning communities