Summary of Findings of Fall 2009 Application of Patterns of Adaptive Learning Scales (PALS)

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University of Michigan

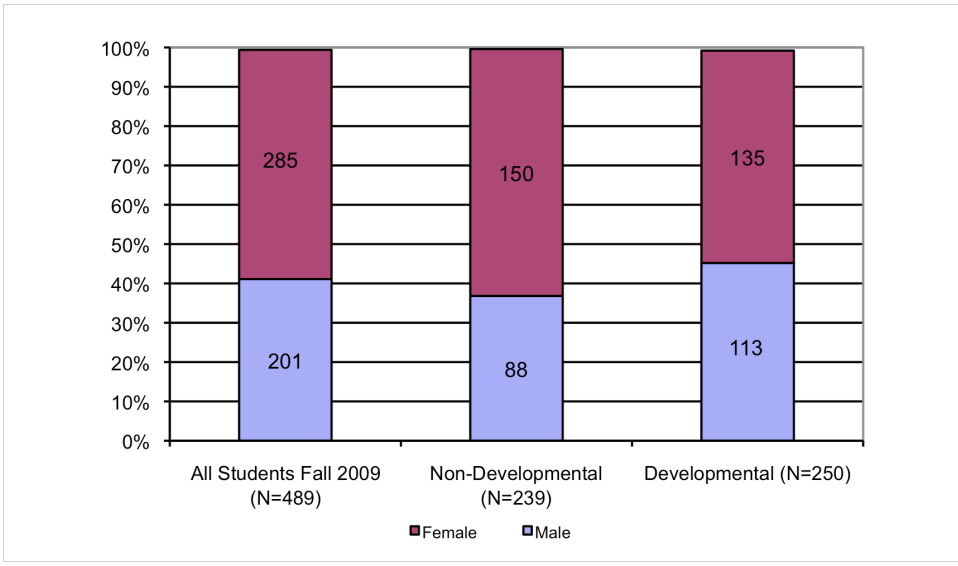
As of December of 2009 a total of 537 surveys were collected in twenty-seven classes taught by nineteen instructors during Fall 2009. The surveys were administered in sections of the following courses: Foundations of Math (Math 067), Foundations of Algebra (Math 097), Everyday College Math (Math 125), Functional Math for Elementary Teachers I and II (Math 148 and Math 149), Math Applications for Health Science (Math 167), Intermediate Algebra (Math 169), and Trigonometry (Math 178). One survey was discarded because it had problems with the responses. There were 47 blank surveys returned (9%), by under-age students (35, 7%) or student who opted out (12 students, 2%).

Course	Name	#Sections Surveyed
067	Foundations of Mathematics	4
097	Foundations of Algebra	11
125	Everyday College Math	2
148	Functional Math for Elementary Teachers I	2
149	Functional Math for Elementary Teachers II	1
167	Math Applications for Health Science	1
169	Intermediate Algebra	4
178	Trigonometry	2

First we present the demographics of the sample, by gender, age, and type of course. Then we present the findings for the 11 scales of the survey. The appendix contains the scales, the items, and the reliability of the scales.

Demographics

Figure 1 presents distribution of the students in the sample by type of course (developmental or non-developmental) and gender, age group by gender, and type of course and ethnicity.


100%
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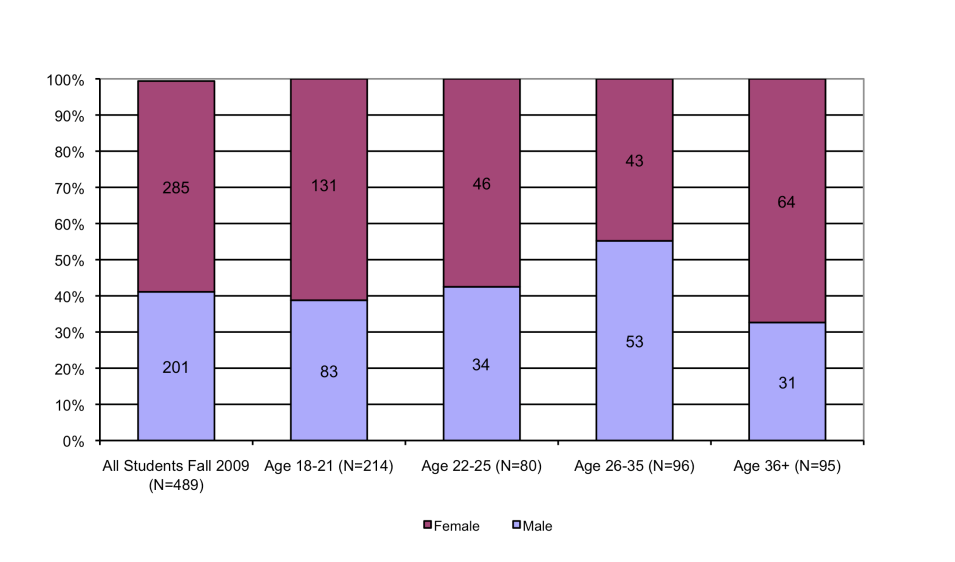
80%
70%
60%
50%
40%
30%
20%
10%
0%
285
201
150
88
135
113
All Students Fall 2009 (N=489)
Non-Developmental (N=239)
Developmental (N=250)
Female
Male

(a)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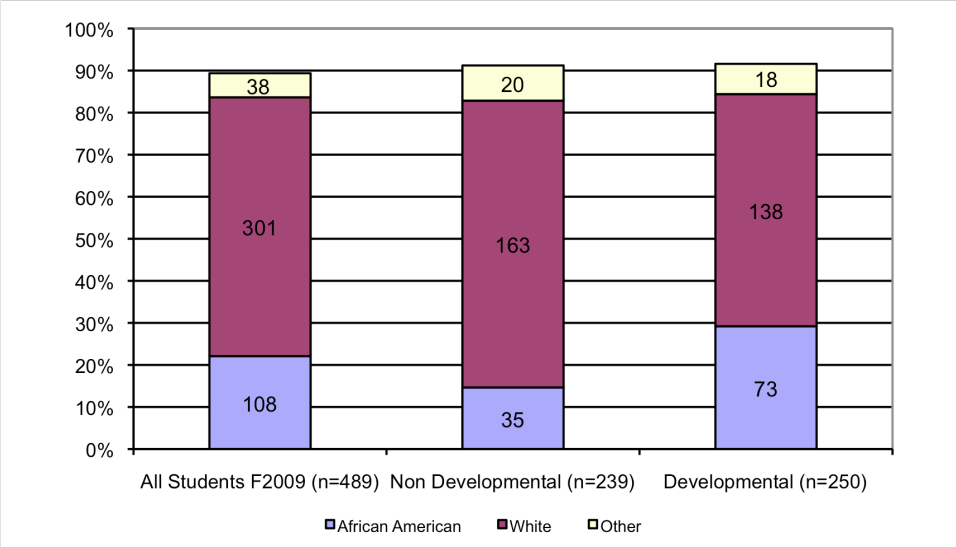
285
201
131
83
46
34
43
53
64
31
All Students Fall 2009 (N=489)
Age 18-21 (N=214)
Age 22-25 (N=80)
Age 26-35 (N=96)
Age 36+ (N=95)
Female
Male

(b)

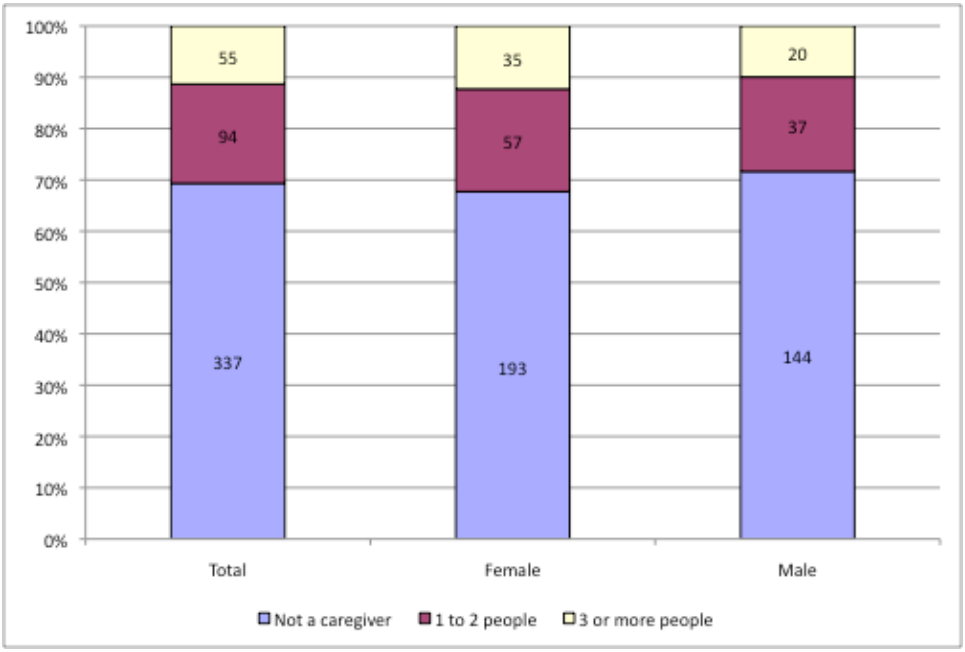


(c)

Figure 1: Distribution of the students in the sample by (a) type of course and gender; (b) age group and gender; (c) type of course and ethnicity.

There are more female than male students in this sample, which is consistent with the overall school's statistics. The difference persists when comparing this proportion by type of course ($\chi^2(1) = 4.498$, $p < .05$). The proportion of African American students in developmental courses is larger than the proportion of White students or students from other ethnicities ($\chi^2(2) = 14.438$, $p < .001$).

We also asked students whether they were primary caregivers of any children or other family members. Seventy percent of the students answered as not being primary caregivers for others in their families, 20% indicating being primary caregivers for one or two people, and 10% indicated being caregivers for 3 or more people. There were no differences by gender, but there were differences by age ($\chi^2(6) = 134.8$, $p < .001$), ethnicity ($\chi^2(4) = 10.63$, $p < .05$), time ($\chi^2(6) = 18.69$, $p < .01$), and type of course ($\chi^2(2) = 5.82$, $p < .05$, see Figure 2).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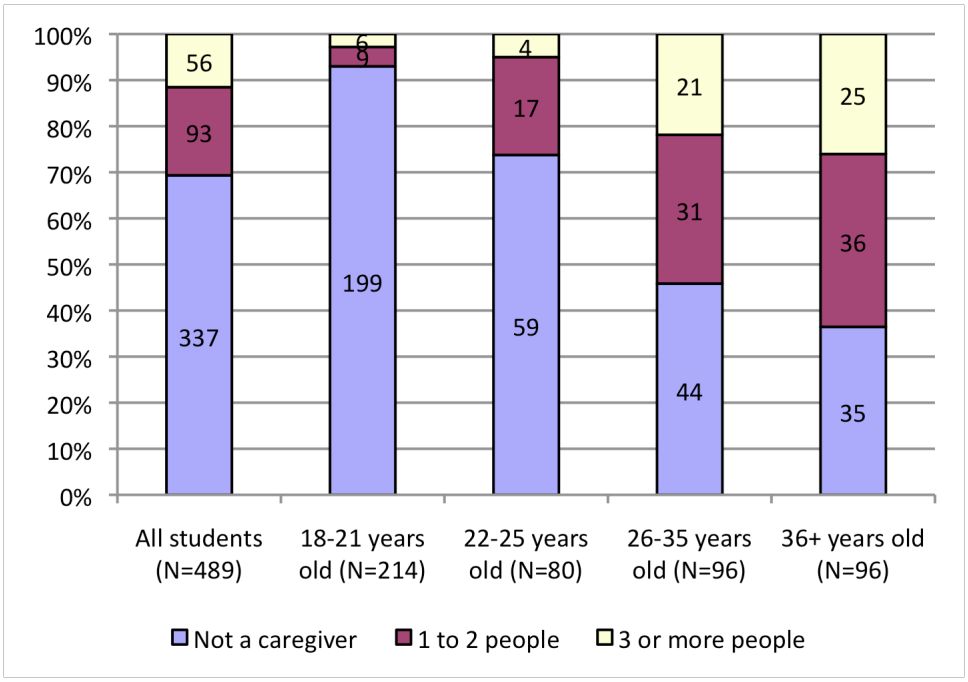
55
94
337
35
57
193
20
37
144
Total
Female
Male
Not a caregiver
1 to 2 people
3 or more people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337
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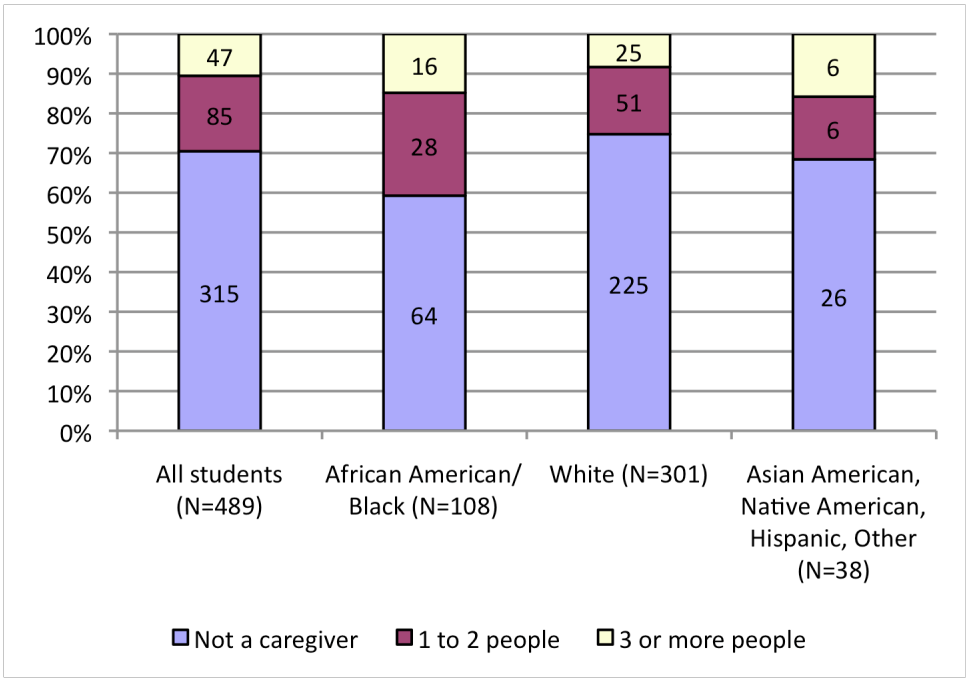
59
21
31
44
25
36
35
All students (N=489)
18-21 years old (N=214)
22-25 years old (N=80)
26-35 years old (N=96)
36+ years old (N=96)
Not a caregiver
1 to 2 people
3 or more people

(b)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47
85
315
16
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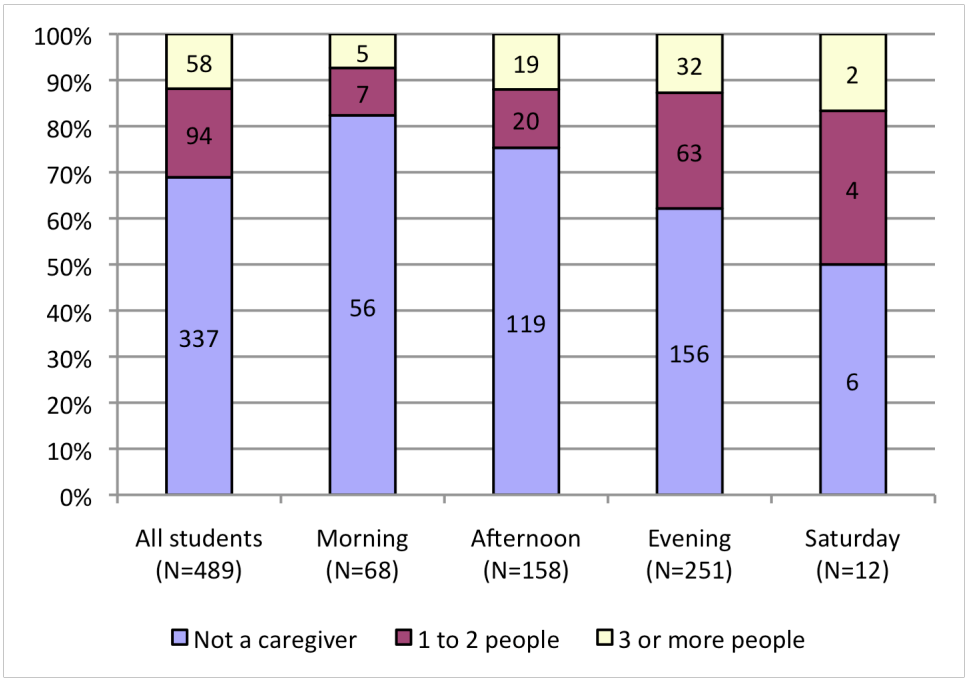
64
25
51
225
6
6
26
All students (N=489)
African American/ Black (N=108)
White (N=301)
Asian American, Native American, Hispanic, Other (N=38)
Not a caregiver
1 to 2 people
3 or more people

(c)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10%
0%
58
94
337
5
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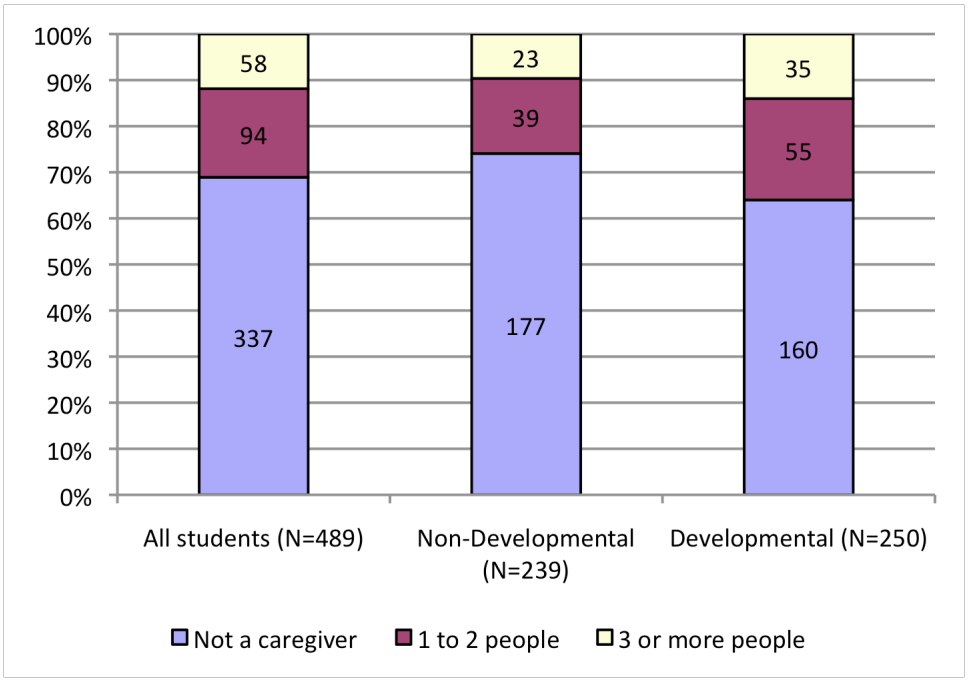
56
19
20
119
32
63
156
2
4
6
All students (N=489)
Morning (N=68)
Afternoon (N=158)
Evening (N=251)
Saturday (N=12)
Not a caregiver
1 to 2 people
3 or more people

(d)



(e)

Figure 2: Distribution of responses according to the number of children or family members for whom the students are primary caregivers by (a) gender, (b) age, (c) ethnicity, (d) time, and (e) type of course.

Number of hours worked at a paid job

More than one fifth (22%) of the sampled students reported that they are not working; another fifth (20%) reported working between 1 and 20 hours a week, and about two fifths of the students (42%) reported working between 21 and 40 hours a week in a paid job (Figure 3).

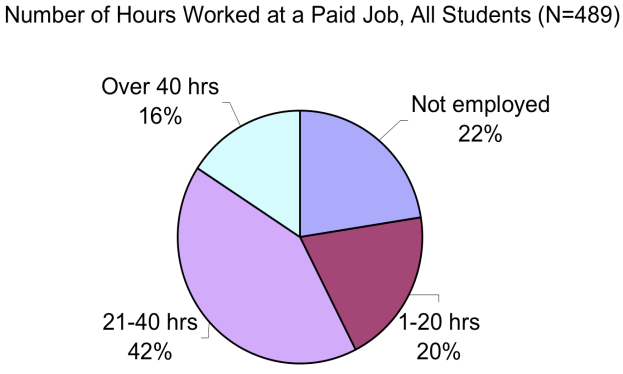


Figure 3: Percentage of hours in a paid job per week

There are slight differences in the frequencies for the male and female samples; similar proportions of males and females reported not working or working less than 20 hours a week. However, more males than females reported working over 40 hours a week (Figure 4). These differences are not statistically significant.

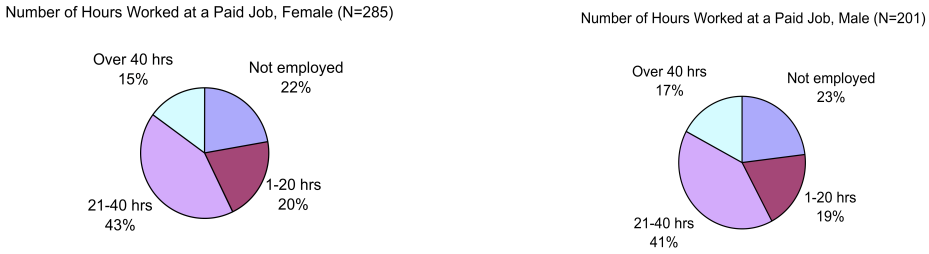


Figure 4: Percentage of hours in a paid job per week by respondent's gender.

Comparable proportions of students in developmental and non-developmental courses report working less than 20 hours or not being employed (Figure 5).

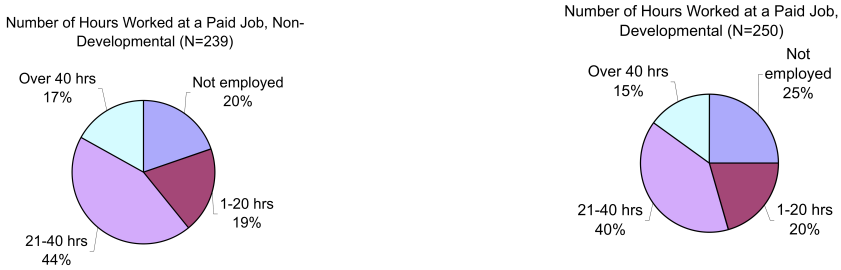
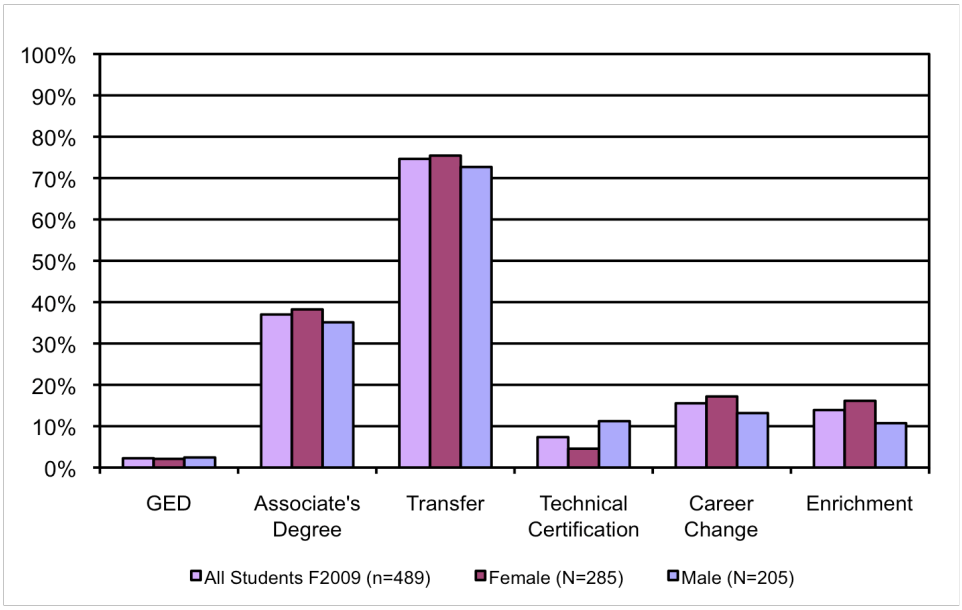


Figure 5: Percentage of hours in a paid job per week by type of course.

Academic goals

In this sample, 74% of the students indicated transfer as a goal. There were no differences in the proportions by students' gender or ethnicity (Figure 6).


100%
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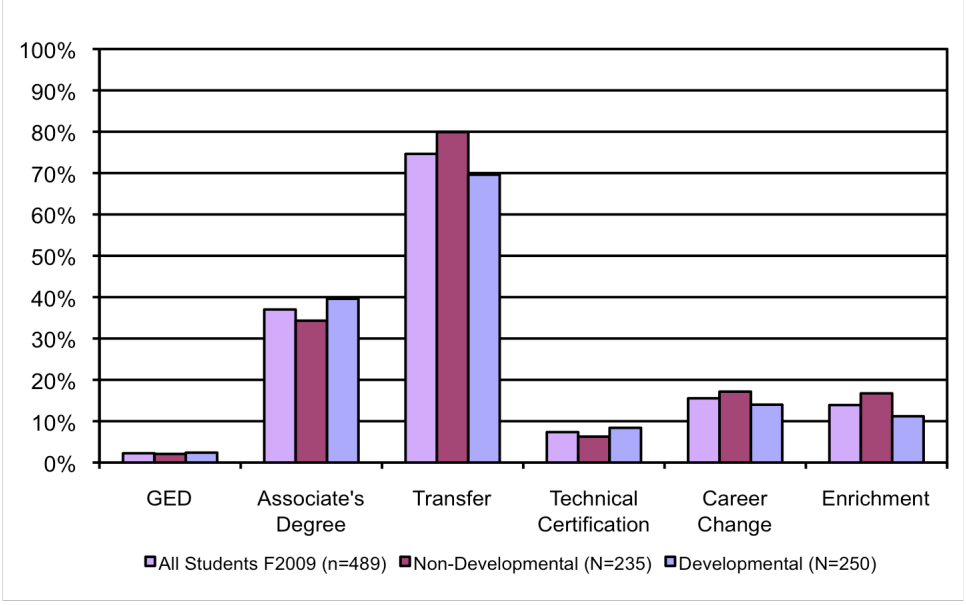
10%
0%
GED
Associate's Degree
Transfer
Technical Certification
Career Change
Enrichment
All Students F2009 (n=489)
Female (N=285)
Male (N=205)

(a)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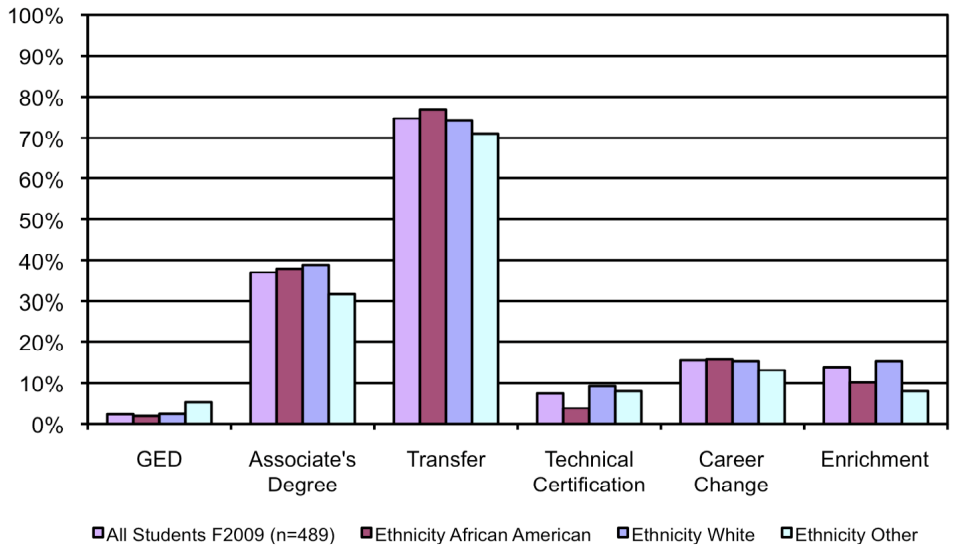
GED
Associate's Degree
Transfer
Technical Certification
Career Change
Enrichment
All Students F2009 (n=489)
Non-Developmental (N=235)
Developmental (N=250)

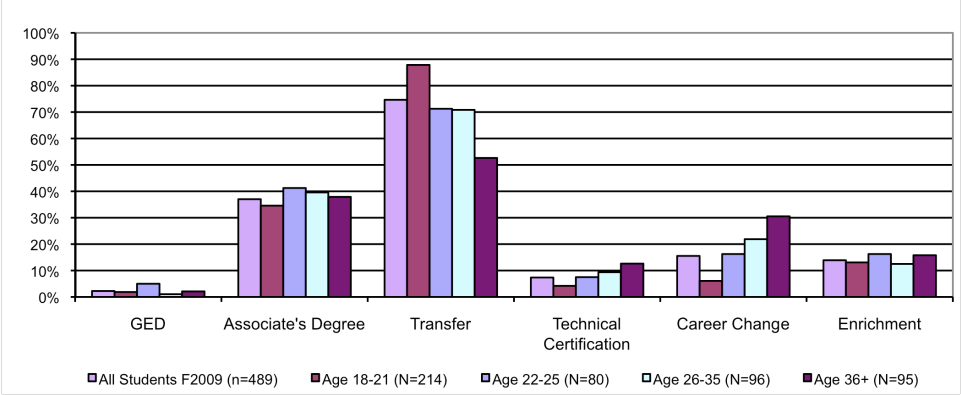
(b)



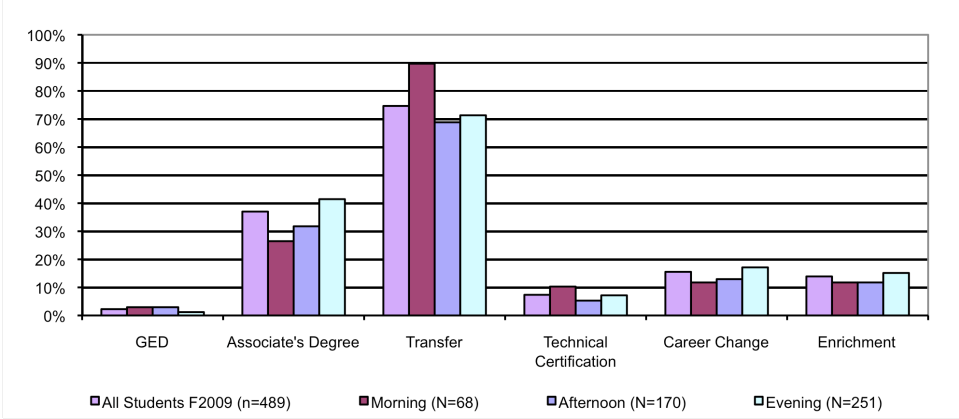
(c)

Figure 6: Distribution of responses of academic goals by (a) gender, (b) type of course, and (c) ethnicity.

Although the proportions of developmental and non-developmental students indicating transfer as a goal is high, the proportion of non-developmental students who plan to transfer is higher than that of developmental students $\chi^2(2) = 7.56$, $p < .01$. A higher percentage of students in the developmental courses than in non-developmental courses report enrichment as a goal ($\chi^2(1) = 3.96$, $p < .05$). This is an interesting difference, considering the assumption that students take developmental mathematics because the courses are required. These results suggest that there is group of students for whom developmental courses offer opportunities for enrichment. Likewise there are significant differences by age for transfer and career change with a higher proportion of students under 21 reporting transfer as a goal ($\chi^2(3) = 42.30$, $p < .001$) and students older than 35 reporting career as a goal ($\chi^2(3) = 31.87$, $p < .001$). The time of the day was also associated with differences in terms of transfer goals ($\chi^2(3) = 10.56$, $p < .05$), with more students in the evening classes not choosing transfer as a goal (see Figure 7).



(a)

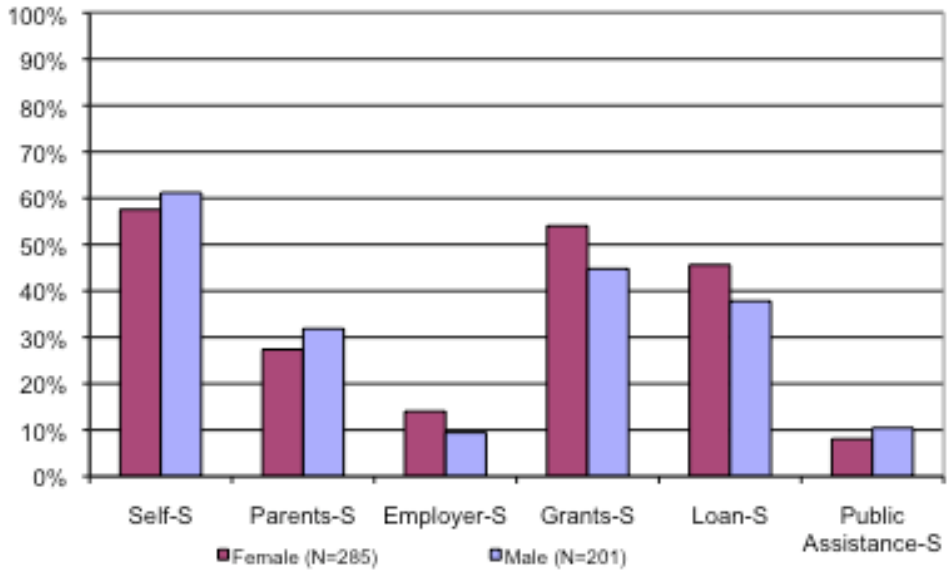


(b)

Figure 7: Distribution of responses of academic goals by (a) age and (b) time of course.

Sources for paying for tuition

Students reported on the sources they relied on for paying their college tuition: self, parents, employer, grants, loans, and public assistance. Students could select as many sources as applicable. Students' own funds were the main source used by students to pay tuition, followed by loans, and grants; parental, employers, and public assistance sources were less frequently chosen (see Figure 8). More females than males indicated using grants and loans to pay for tuition ($\chi^2(1) = 7.32$, $p < .01$ and $\chi^2(1) = 4.27$, $p < .05$, respectively). Regarding ethnicity there were differences in the frequencies reported for all but one (employer) source of funding: African American students reported using grants, loans, and public assistance more frequently than students in the other groups ($\chi^2(2) = 24.43$, $p < .001$; $\chi^2(2) = 12.71$, $p < .01$; and $\chi^2(2) = 6.75$, $p < .05$ respectively); White students reported using personal and parental funds more frequently than students in other ethnic groups ($\chi^2(2) = 24.5$, $p < .001$ and $\chi^2(2) = 6.06$, $p < .05$).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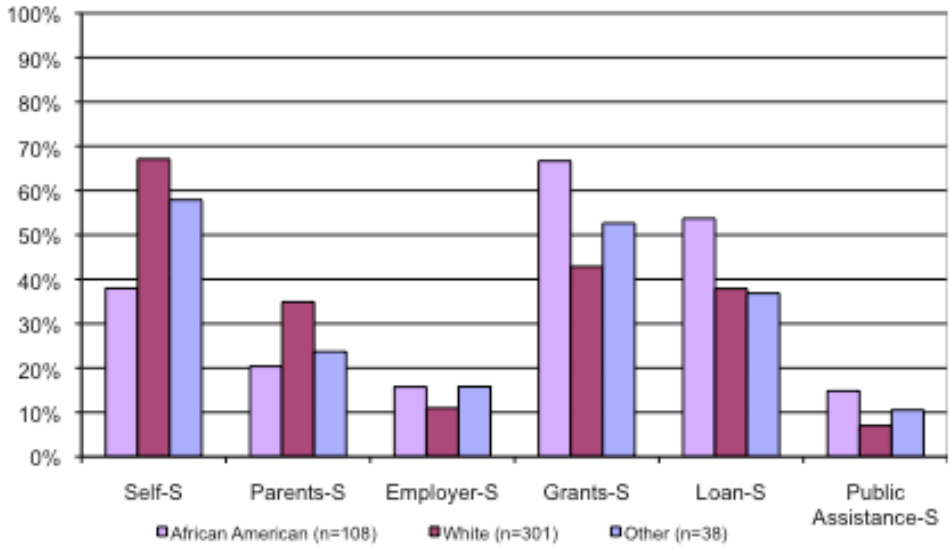
20%
10%
0%
Self-S
Parents-S
Employer-S
Grants-S
Loan-S
Public Assistance-S
Female (N=285)
Male (N=201)

(a)


100%
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20%
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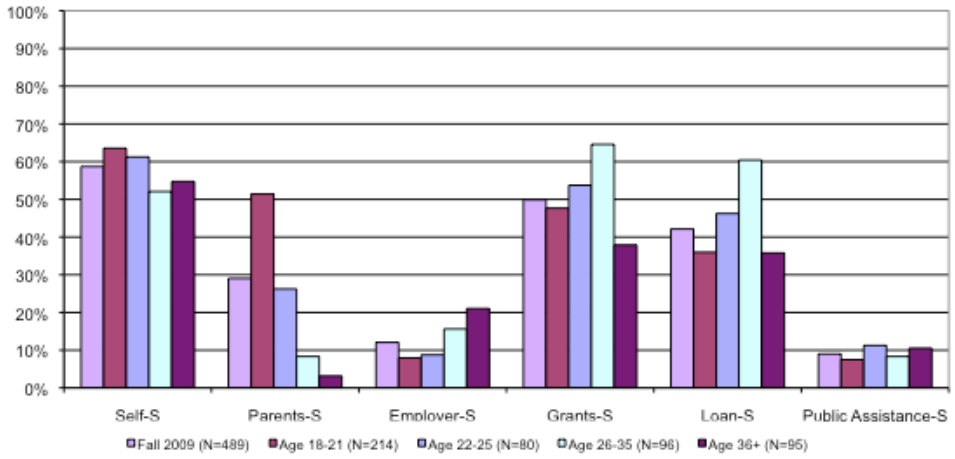
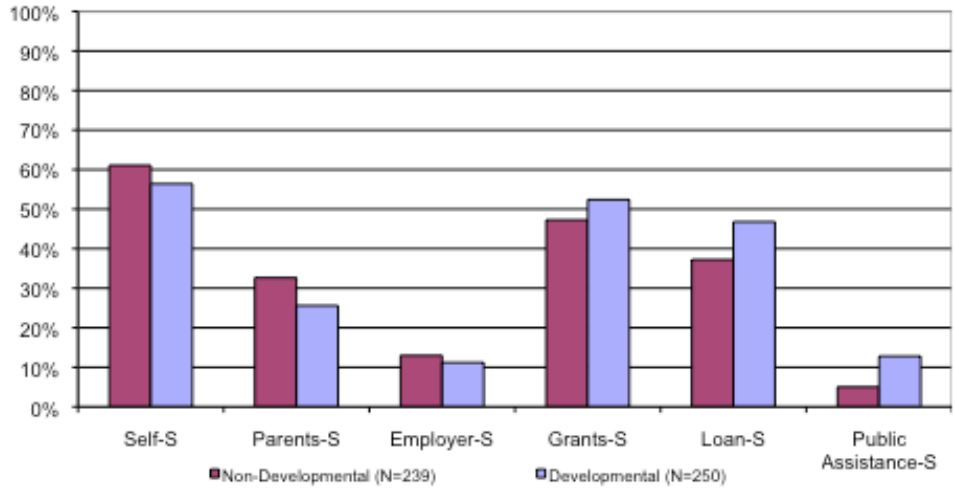
Self-S
Parents-S
Employer-S
Grants-S
Loan-S
Public Assistance-S
African American (n=108)
White (n=301)
Other (n=38)

(b)



(c)



(d)

Figure 8: Distribution of responses about sources used to pay tuition by (a) age (b) ethnicity, (c) age, and (d) type of course.

Students in the 18-21 age group indicated receiving assistance from parents more frequently than students in the other age groups ($\chi^2(3) = 77.97$, $p < .001$); students in the age group 26-35 reported using loans more frequently ($\chi^2(3) = 16.95$, $p < .001$) than students in the other age groups; finally, students in the 36+ age group reported using employer's funds more frequently than students in the other age groups ($\chi^2(3) = 21.55$, $p < .001$). Regarding type of course there were differences for grants, loans, and public assistance, with more developmental students reporting using these sources than non-developmental students ($\chi^2(1) = 4.47$, $p < .05$; $\chi^2(1) = 8.58$, $p < .01$; and $\chi^2(1) = 12.93$, $p < .001$, respectively).

Math courses taken in college and repetition

Students reported on the number of math courses they have taken in college. Thirty-nine percent of the students indicated that they were taking their first math course in college. A large proportion of students have taken 1 or 2 prior math courses in college (44%) and 17% indicated having taken at least three prior courses in college (Figure 9). There were no significant differences by students' gender (Figure 8).

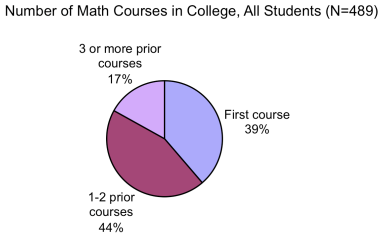


Figure 9: Percentage of students reporting number of math courses taken in college.

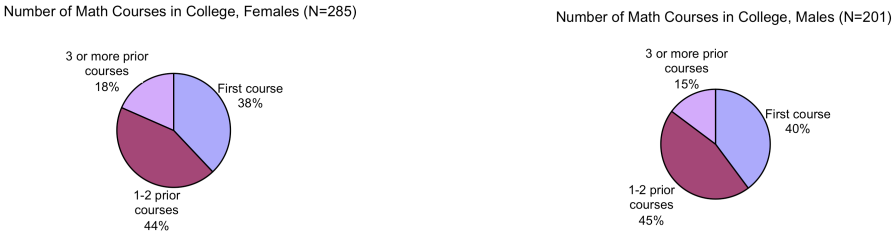


Figure 10: Percentage of students reporting number of math courses taken in college by gender.

There were significant differences by type of course, with more developmental students reporting the course surveyed as their first course (Figure 11, $\chi^2(2) = 51.98$, $p < .001$).

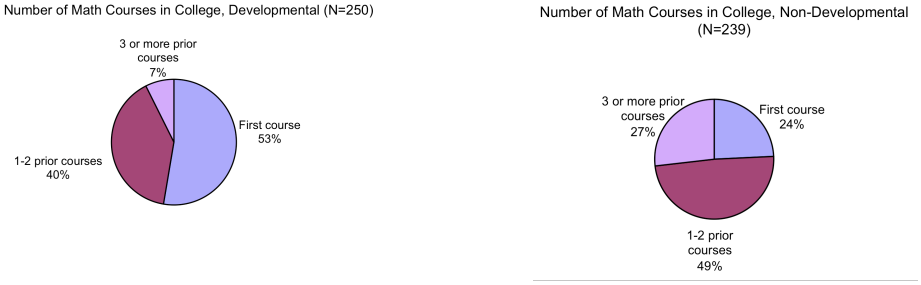


Figure 11: Percentage of students reporting number of math courses taken in college by type of course.

About 30 percent of students for whom the surveyed course was not their first course in college reported that they have repeated a math course (88 out of 293, see Table 1).

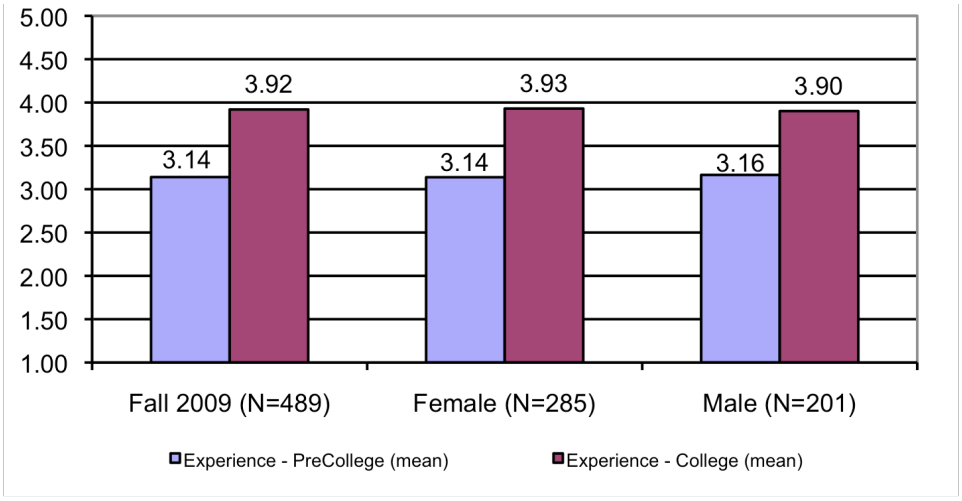
Table 1: Frequency and percent of students reporting repeating a math course by gender, type of course, and age.

		N_1	N_2	N_3	%
All Fall 2009 Students		489	293	88	30%
Gender					
	Female	275	169	53	31%
	Male	187	111	35	32%
Type of course					
	Developmental	244	115	45	39%
	Non-Developmental	241	178	43	24%
Age					
	18-21 years old	203	105	27	26%
	22-25 years old	76	53	21	40%
	26-35 years old	93	67	19	28%
	36 years old or older	89	67	21	31%
Ethnicity					
	African American	108	63	23	37%
	White	285	181	48	27%
	Other	35	25	7	28%

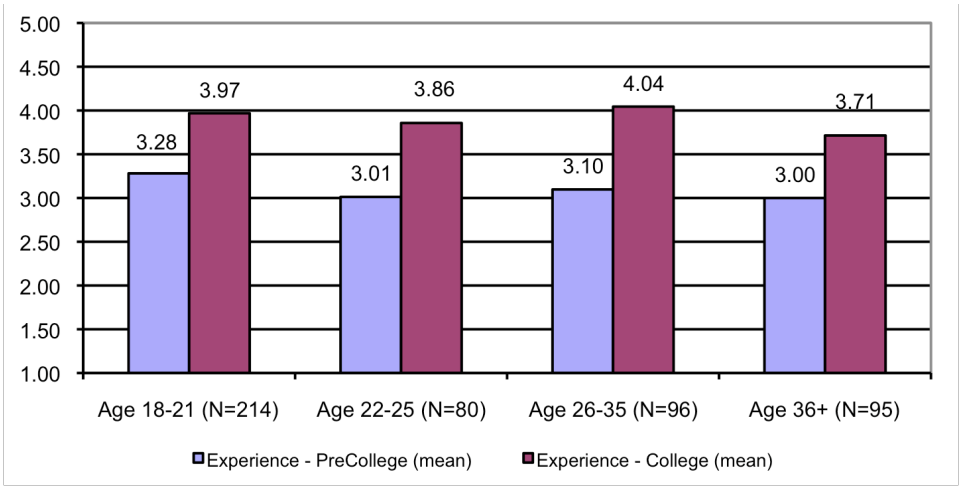
Note: N_1 Number of students in the full sample; N_2: Number of students who have taken at least one prior math course in college. N_3: Number of students repeating a math course in college. % Proportion of students who have repeated a course in college out of those who have taken at least one prior course in college.

Experiences with mathematics

Students reported more positive experiences in math during college as a group overall, and independently of gender, type of course, age, or ethnicity. There were no significant differences in math experiences prior to or during college by gender, age, ethnicity, or type of course (Figure 12).


5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
3.14
3.92
3.14
3.93
3.16
3.90
Fall 2009 (N=489)
Female (N=285)
Male (N=201)
Experience - PreCollege (mean)
Experience - College (mean)

(a)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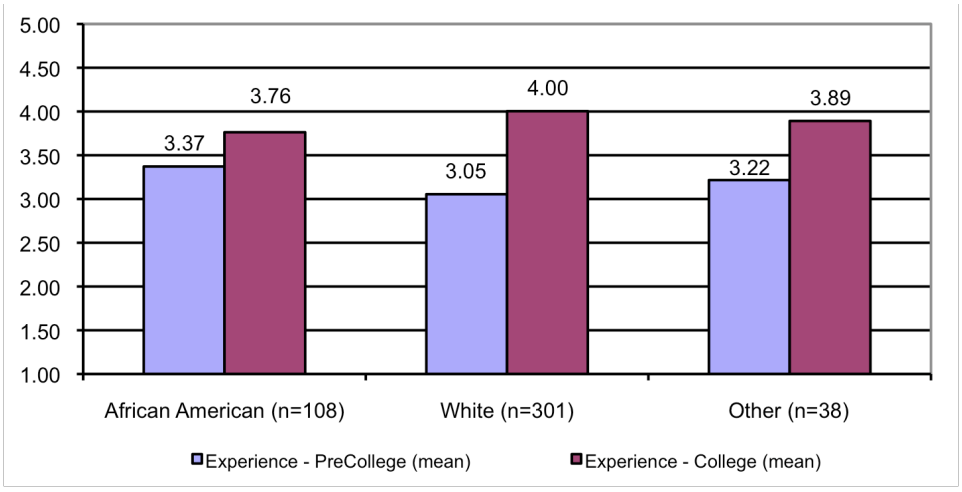
3.01
3.86
3.10
4.04
3.00
3.71
Age 18-21 (N=214)
Age 22-25 (N=80)
Age 26-35 (N=96)
Age 36+ (N=95)
Experience - PreCollege (mean)
Experience - College (mean)

(b)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3.76
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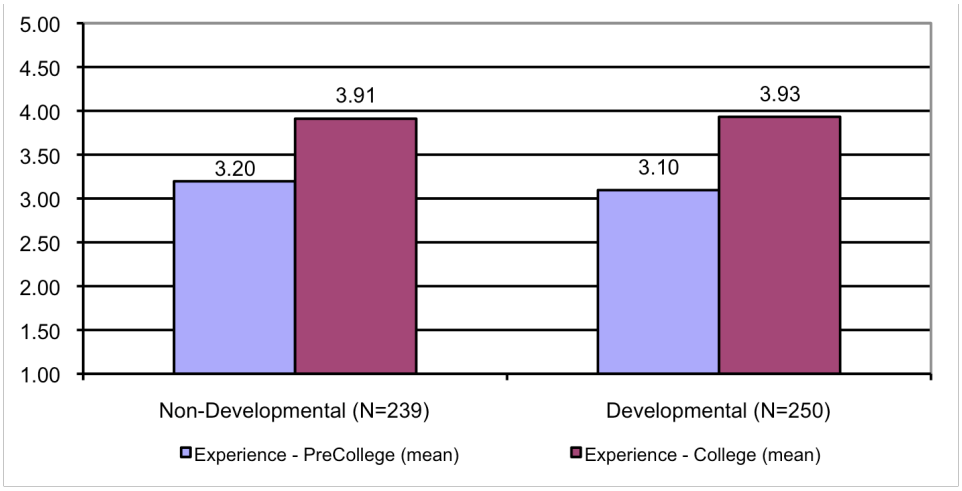
4.00
3.22
3.89
African American (n=108)
White (n=301)
Other (n=38)
Experience - PreCollege (mean)
Experience - College (mean)

(c)



(d)

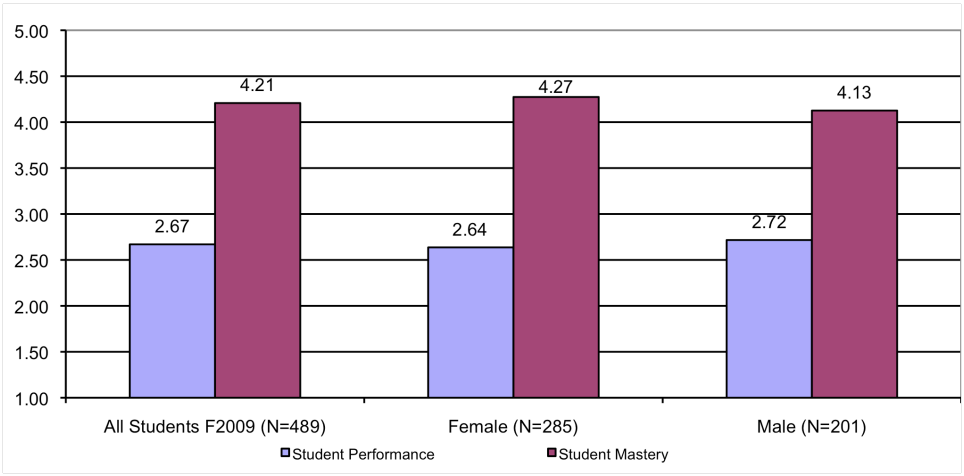
Figure 12: Average of students' rating of past experiences with math prior to college and in college, from very negative (1) to very positive (5) by (a) gender, (b) age, and (c) ethnicity, and (d) type of course.

Scales

Similarly to the results from the first year, the students in this sample rated the Mastery scale higher than the Performance scale. This result was consistent across all subsamples, and is a result in the expected direction (see Figure 13). It means that students' goals are oriented towards mastering the material, rather than to showing good performance, and such characterization is associated with higher student performance in standardized tests. For the Student Mastery scale there are significant differences

- by gender, with females rating this scale higher than males ($t(484) = 2.76$, $p < .01$);
- age (main effect, $F(3, 482) = 3.91$, $p < .01$), with students in the 18-21 age range rating this scale lower than the students in the 26-35 range (difference = -.23, $p < 0.01$); and
- type of course, with developmental students rating the scale higher than students in non-developmental courses ($t(487) = 3.56$, $p < .001$).

There were no differences by ethnicity or time of day in which the course was offered. Likewise there were no differences by gender, age, ethnicity or time of day for the Student Performance scale.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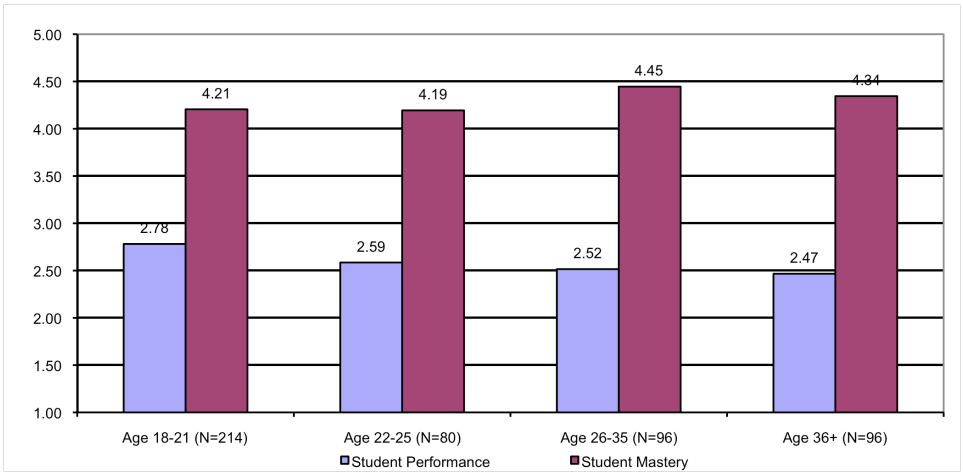
4.27
4.13
2.67
2.64
2.72
All Students F2009 (N=489)
Female (N=285)
Male (N=201)
Student Performance
Student Mastery

(a)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4.50
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1.50
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4.21
4.19
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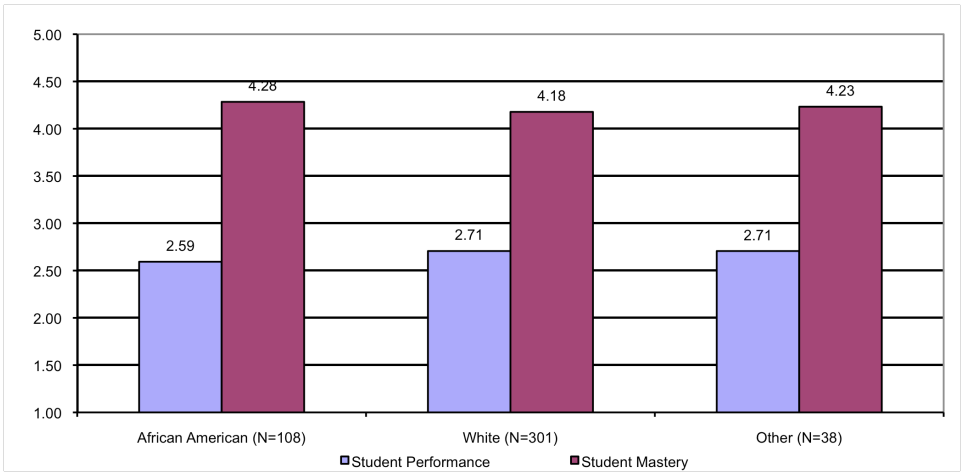
4.34
2.78
2.59
2.52
2.47
Age 18-21 (N=214)
Age 22-25 (N=80)
Age 26-35 (N=96)
Age 36+ (N=96)
Student Performance
Student Mastery

(b)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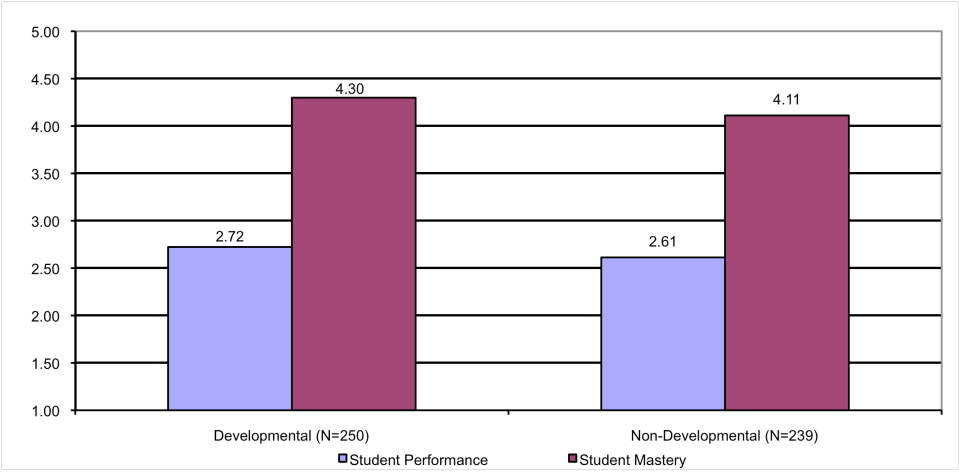
2.59
2.71
2.71
African American (N=108)
White (N=301)
Other (N=38)
Student Performance
Student Mastery

(c)



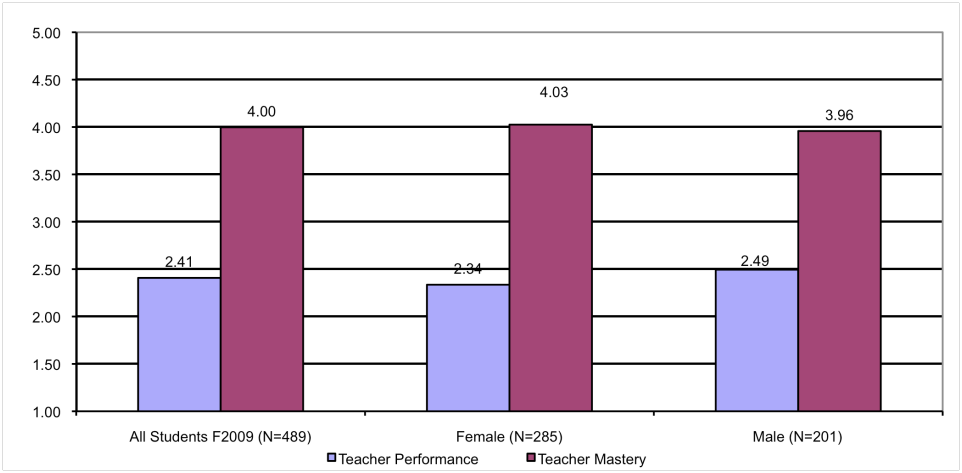
(d)

Figure 13: Scores in items measuring goals oriented towards mastery and performance by (a) gender, (b) age, (c) ethnicity, and (d) type of course.

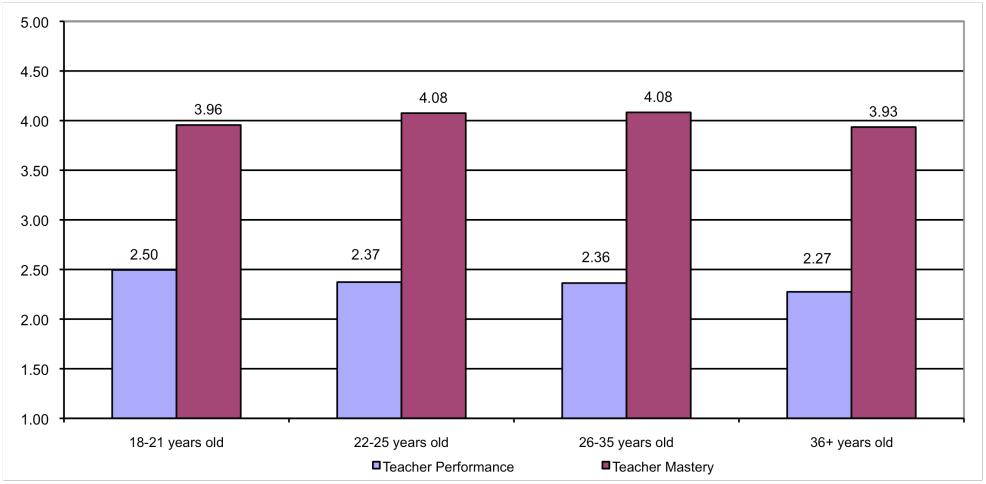
The survey also asked students to rate their perception of what types of goals their teachers emphasized, either towards mastery or towards performance. In general the students also perceived that their instructors emphasized mastery over performance goals; these results were consistent by age, gender, ethnicity, and type of course (see Figure 14) although there were differences in the subsamples:

- Males rated their perception of teachers pressuring for performance goals higher than females ($t(484) = -2.77, p < .01$);
- students in developmental courses rated their perceptions of teachers pressuring for mastery higher than students in non-developmental courses $t(484) = 3.14, p < .01$); and
- there was a main effect of age for Teachers Performance ($F(3, 482).=3.095, p < .05$) with students in the age range 18-21 rating the scale lower than students in the 36+ range (difference = .22, $p < .05$).

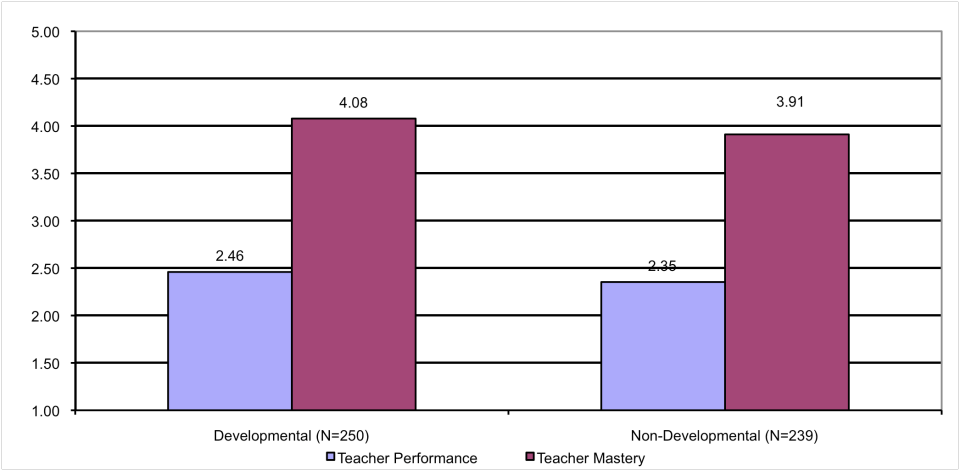
There were no differences for ethnicity.



(a)



(b)



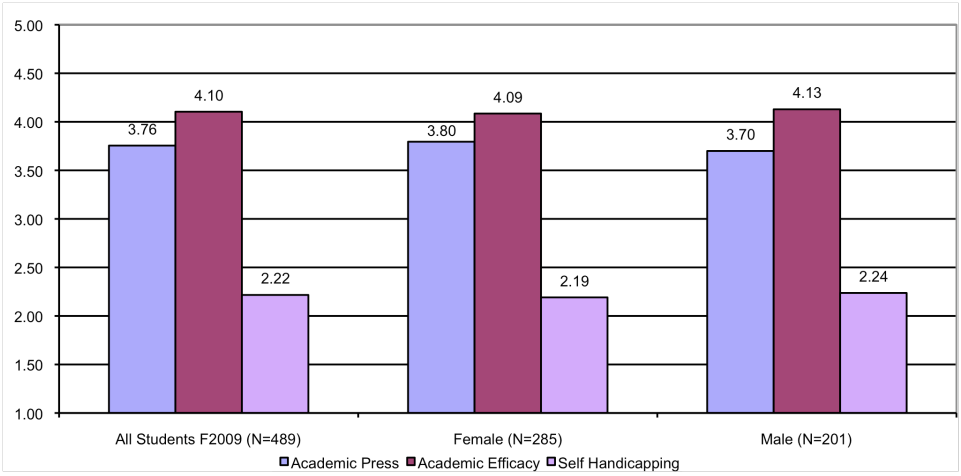
(c)

Figure 14: Scores in items measuring students' perceptions of their teachers' emphasis on goals oriented towards mastery and performance by (a) gender, (b) age, and (c) type of course.

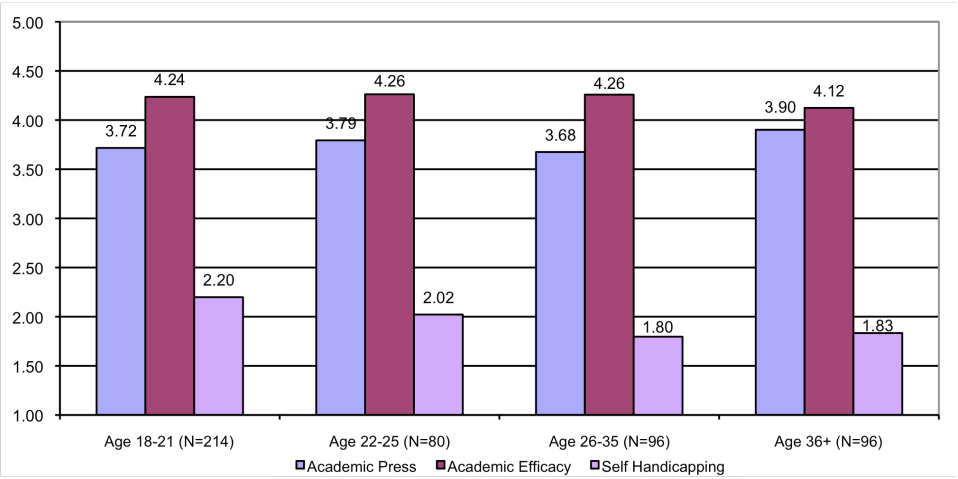
There were three other scales intended to establish students' perceptions of whether their teachers press them academically to think and do hard work, and students' sense of self-efficacy and self-handicapping behaviors.

The average scores on these scales are in the expected direction. That is, students report that their teachers press them to think and work hard, that they have a high sense of efficacy and that they tend not to engage in self-handicapping behaviors. These results are consistent by gender, age, ethnicity, and type of course, although there are slight differences within each subgroup (see Figure 15). Developmental students rated higher their perception of Academic Press than non-developmental students ($t(471) = 2.44, p < .05$). Developmental students rate higher than non-developmental students their sense of Academic Efficacy ($t(487) = 2.71, p < .01$); and there is a main effect of age on this scale ($F(3, 482) = 3.08, p < .05$) with students in the 26-35 age range rating this scale higher than students in the 36+ range (difference = .26, $p < .05$). There is a main effect of age on Self-handicapping Behaviors ($F(3, 482) = 4.67, p < .01$) with students in the 18-21 range rating the scale

higher than students in the 36+ range (difference = .34, $p < .01$). There were no significant differences by ethnicity.



(a)



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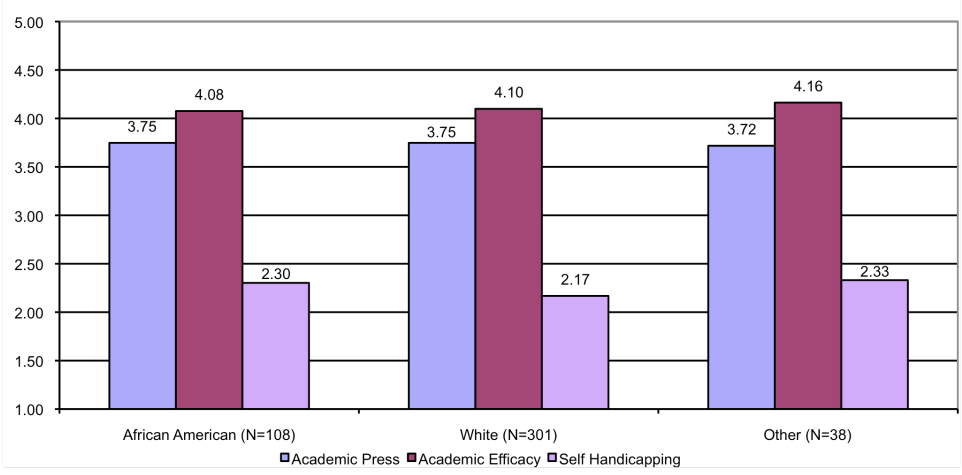

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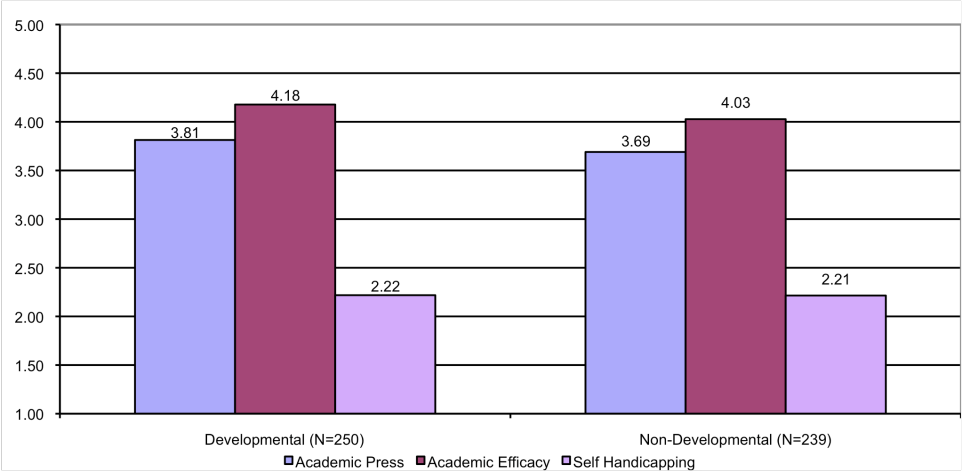
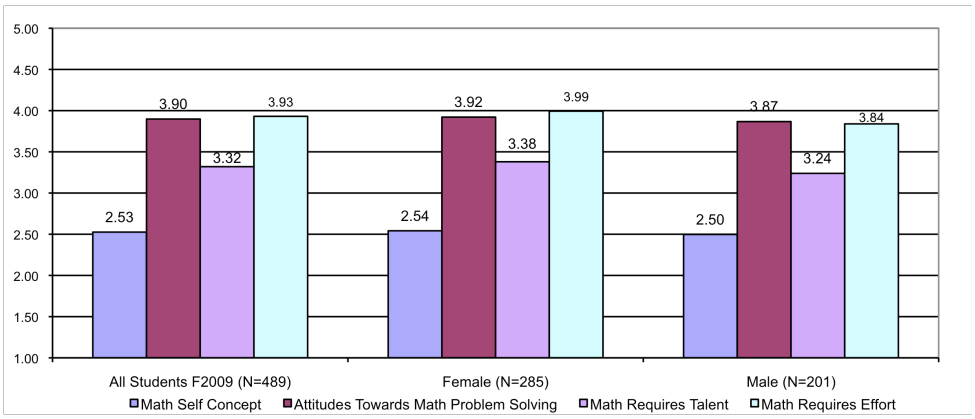


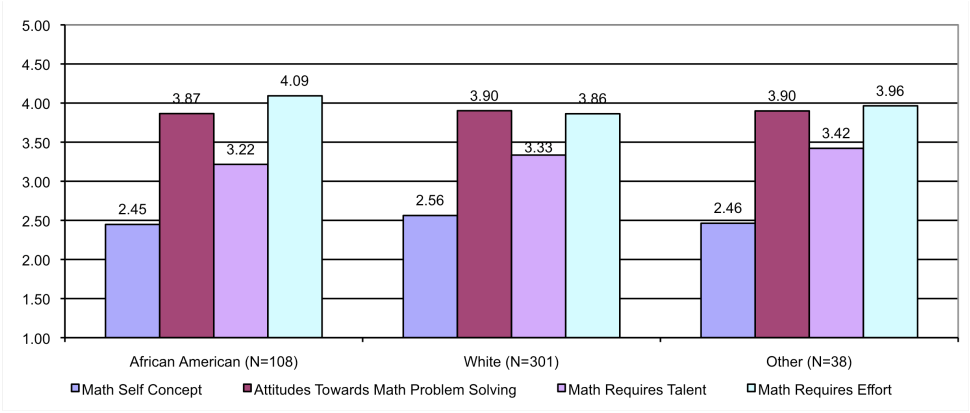
(d)

Figure 15: Average scores on Academic Press, Academic Self-Efficacy, and Self-Handicapping scales, for (a) all students and by gender, (b) age, (c) ethnicity, and (d) type of course.

This survey included 18 new items intended to determine students' mathematics self-concept, their attitudes towards mathematics problem solving, and their perception that mathematics requires talent or effort (see Appendix). These were organized into four scales to ease the analysis. Because the reliabilities of these scales were moderate to low (range from .565 to .767) the results need to be interpreted with caution.



(a)



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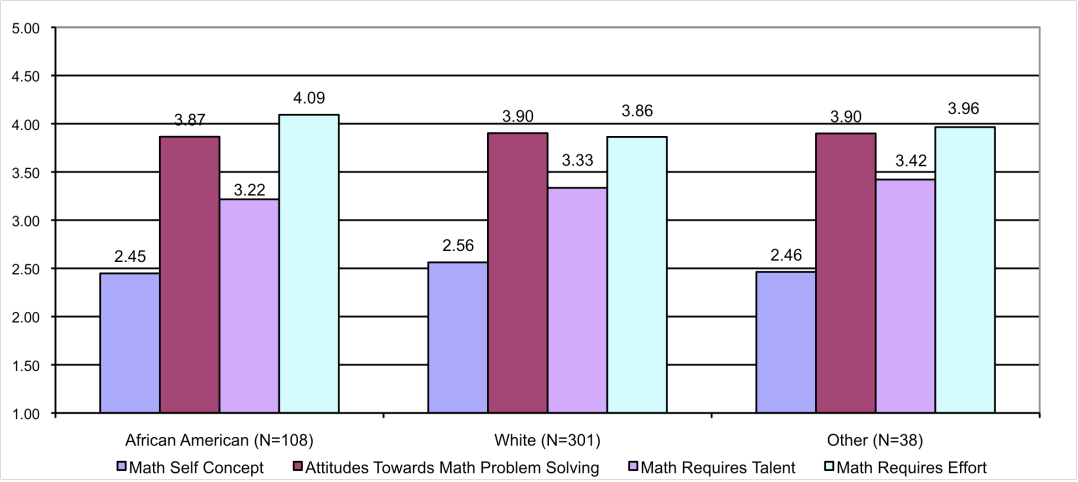

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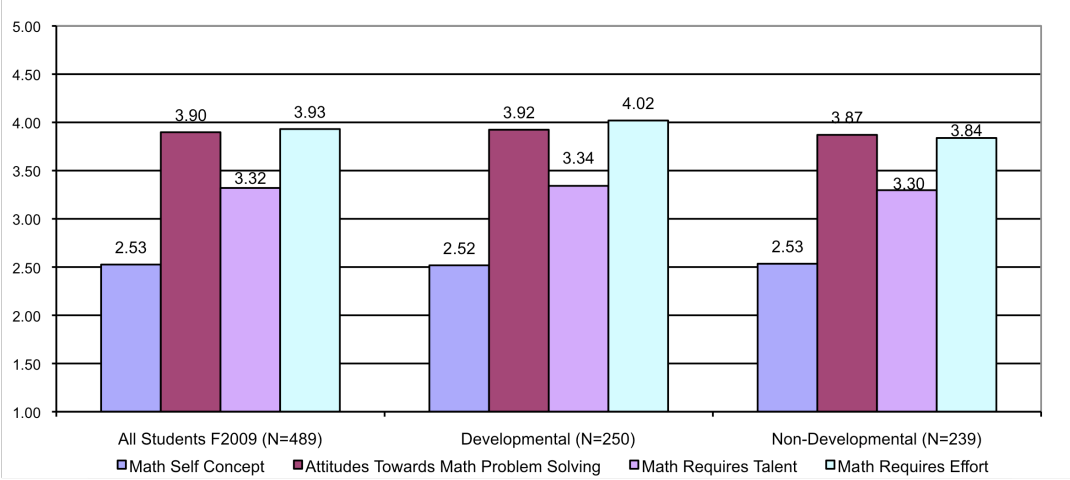

(d)

Figure 16: Average scores on Math Self-Concept, Attitudes towards Problem Solving, Talent, and Effort scales for (a) all students and by gender, (b) age, (c) ethnicity, and (d) type of course.

The following are the results of the analysis of these scales:

- Math Self-Concept: There was a main effect of age ($F(3,482) = 5.705$, $p < .001$), with students in the age 18-21 range rating their Math Self Concept higher than students in the 26-35 age range(difference = .34, $p < .001$).
- Attitudes towards Problem Solving: There was a main effect of age ($F(3, 482)=7.761$, $p < .001$), with students in the 18-21 age range scoring lower than students in the 22-25 age range (difference = .184, $p < .05$) and in the 26-35 age range (difference = .25, $p < .001$).
- Talent: this scale tended to be scored similarly across all groups, but there was a significant difference by gender, with females scoring higher than males ($t(484) = 2.07$, $p < .05$). This scale was consistently scored lower than the Talent scale ($t(487) = 16.21$, $p < .001$).
- Effort: there were significant differences by gender ($t(484)= 2.457$, $p < .05$), type of course ($t(487) = 2.941$, $p < .01$), age ($F(3, 482) = 9.273$, $p < .001$) and ethnicity ($F(2, 444) = 4.578$, $p < .05$). In addition,

- students in the 18-21 age range rated the Effort scale lower than students in the 26-35 and 36 + age range (difference = .349, $p < .001$ and .309, $p < .001$ respectively);
- students in the 22-25 age range rated the Effort scale lower than students in the 26-35 age range and in the 36+ age range (difference = .339, $p < .01$, and = .299, $p < .05$ respectively); and
- White students rated the Effort scale lower than African American Students (difference = .229, < .01).

Synthesis

The findings from the analysis of the data collected through this survey with this sample of students suggest that it is possible to distinguish the two types of goals, mastery and performance, both as students formulated them and as they see their teachers promoting them in the classroom. In addition the findings suggest that the students show a tendency towards mastery goals, meaning that they are interested in mastering the material, which in turn has been associated with adaptive patterns of learning. When oriented to mastery goals, "students' purpose or goal in an academic setting is to develop their competence. They seek to extent their mastery and understanding. Learning is perceived as inherently interesting, and end in itself. Attention is focused on the task." (Midgley, et al., 2000). In addition the students in this sample appear to reject performance goals, by which students' goals are formulated in terms of either demonstrating competence or avoiding demonstrating incompetence; these goals are focused on the self. In general these goals have been associated with maladaptive patterns of learning.

The students also report that students perceive that their teachers press them for understanding; likewise, the students report a high sense of personal responsibility, expressed by their high scores on self-efficacy, low scores on self-handicapping behaviors, and high scores in academic press. In general the data suggest that the profile of the students surveyed is one of committed students towards learning.

Regarding the new scales, the survey reveals a somewhat low math self-concept, which is consistent with teachers' perception of these students. However, students report that in order to succeed in mathematics, effort, rather than talent is important. The scores also suggest that students have a positive attitude towards mathematical problem solving.

Reference

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., & Others (2000). *Manual for the Patterns of Adaptive Learning Scales*. Ann Arbor, MI: University of Michigan.

Appendix: PALS Subscales, Reliability, and Items

The following items were presented to the students in the individual test. The number represents the order in which they appear in the printed form. Students had to rate the items on a 1-5 scale, with 1 being Strongly Disagree, 2 Agree, 3 Neutral, 4 Agree, and 5 Strongly Agree. This survey differs from the version administered in the year 2009 in two important ways. First we removed two scales that did not appear to inform our research substantially, Novelty Avoidance and Relevance, and incorporated items from the Views About Mathematics Survey [VAMS][1], that address students' attitudes and perceptions towards mathematics and problem solving. Second, we included questions about students' backgrounds regarding their sources of funding for their college studies. The factor analysis with the original PALS scales explained 59% of the variance of the items. The factor analysis with the new (18) items resulted in four scales that explained 49% of the variance in s to these items (principal component with varimax rotation; only items with loadings above .40 were kept). The scales were generated using the average of the items in the scales. All the items within each scale, together with the reliability of the scale measured with the Cronbach's alpha coefficient, are given below.

Student Mastery, (α = .844)

When oriented to mastery goals, "students' purpose or goal in an academic setting is to develop their competence. They seek to extent their mastery and understanding. Learning is perceived as inherently interesting, and end in itself. Attention is focused on the task."[2]

M 7. It's important to me that I learn a lot of new concepts this semester.

M 19. One of my goals in class is to learn as much as I can.

M 21. One of my goals is to master a lot of new skills this semester.

M 25. It's important to me that I thoroughly understand my class work.

M 34. It's important to me that I improve my skills this semester.

Student Performance (α = .880)

Performance goals are formulated in terms of either demonstrating competence or avoiding demonstrating incompetence; these goals are focused on the self. These goals have been associated with both adaptive and maladaptive patterns of learning, although the evidence appears to suggest a stronger support for maladaptive patterns (as learning appears to be extrinsically motivated).

PA 6. It's important to me that other students in my class think I am good at my class work.

PA 20. One of my goals is to show others that I'm good at my class work.

PA 27. One of my goals is to show others that class work is easy for me.

PA 31. One of my goals is to look smart in comparison to the other students in my class.

PA 33. It's important to me that I look smart compared to others in my class.

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[1]Carlson, M. (1999). The mathematical behavior of six successful mathematics graduate students: Influences leading to mathematical success. *Educational Studies in Mathematics, 40*, 237-258.

[2]Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., & Others. (2000). *Manual for the Patterns of Adaptive Learning Scales.* Ann Arbor, MI: University of Michigan.

PAv 2. It's important to me that I don't look stupid in class.

PAv 23. One of my goals is to keep others from thinking I'm not smart in class.

PAv 35. It's important to me that my teacher doesn't think that I know less than others in class.

PAv 38. One of my goals in class is to avoid looking like I have trouble doing the work.

Teacher Mastery (α = .802)

These items measure students' perceptions that their teachers' goals are oriented towards mastery.

TM 42. My teacher recognizes us for trying hard.

TM 44. My teacher really wants us to enjoy learning new things.

TM 46. My teacher wants us to understand our work, not just memorize it.

TM 48. My teacher thinks mistakes are okay as long as we are learning.

TM 50. My teacher gives us time to really explore and understand new ideas

Teacher Performance (α = .828)

These items measure students' perceptions that their teachers' goals are oriented towards performance.

TPA 45. My teacher points out those students who get good grades as an example to all of us

TPA 47. My teacher lets us know which students get the highest scores on a test.

TPA 52. My teacher tells us how we compare to other students.

TPAv 43. My teacher says that showing others that we are not bad at class work should be our goal.

TPAv 49. My teacher tells us it's important to join in discussions and answer questions so it doesn't look like we can't do the work.

TPAv 51. My teacher tells us that it is important that we don't look stupid in class

TPAv 53. My teacher tells us it's important to answer questions in class, so it doesn't look like we can't do the work.

Academic Press (α = .810)

These items measure students' perceptions that their teachers press them towards challenging work and thinking.

Pr 4. When I've figured out how to do a problem, my teacher gives me more challenging problems to think about.

Pr 8. My teacher presses me to do thoughtful work.

Pr 12. My teacher asks me to explain how I get my answers.

Pr 14. When I'm working out a problem, my teacher tells me to keep thinking until I really understand.

Pr 16. My teacher doesn't let me do just easy work, but makes me think.

Pr 37. My teacher makes sure that the work I do really makes me think.

Pr 40. My teacher accepts nothing less than my full effort.

Academic Self-Efficacy (α = .831)

These items measure students' perceptions that they are capable of doing class work.

AE 1. I'm certain I can master the skills taught in class this semester.

AE 36. I can do almost all the work in class if I don't give up.

AE 39. Even if the work is hard, I can learn it.

AE 41. I can do even the hardest work in this class if I try.

AE 9. I'm certain I can figure out how to do the most difficult class work.

Self Handicapping (α = .847)

These items measure students' perceptions that they engage in activities that can reduce their opportunities for success in college.

SH 10. Some students fool around the night before a test. Then if they don't do well, they can say that is the reason. Would you agree that this statement applies to you?

SH 13. Some students purposely get involved in lots of activities. Then if they don't do well on their class work, they can say it is because they were involved with other things. Would you agree that this statement applies to you?

SH 15. Some students look for reasons to keep them from studying (not feeling well, having to help their parents, taking care of a sibling/child, etc.). Then if they don't do well on their class work, they can say this is the reason. Would you agree that this statement applies to you?

SH 28. Some students let their friends keep them from paying attention in class or from doing their homework. Then if they don't do well, they can say their friends kept them from working. Would you agree that this statement applies to you?

SH 30. Some students purposely don't try hard in class. Then if they don't do well, they can say it is because they didn't try. Would you agree that this statement applies to you?

SH 32. Some students put off doing their class work until the last minute. Then if they don't do well on their work, they can say that is the reason. Would you agree that this statement applies to you?

Math Self-Concept (α = .767)—Added to the Fall 2009 Survey

Adapted from the VAMS, these items measure students' self image as mathematics learners.

MSC 4 For me, solving math problems is usually an enjoyable experience.

MSC 13 When I experience difficulty while studying math, I give up.

MSC 20 For me, doing math problems in more than one way is a waste of time.

MSC 28 For me, solving a math problem is usually a frustrating experience.

MSC 45 For me, making unsuccessful attempts when solving a math problem is an indication that I'm not good at math.

Problem Solving Attitude (α = .592)—Added to the Fall 2009 Survey

Adapted from the VAMS, these items measure students' engagement in productive mathematical problem solving patterns.

PS 6 After the teacher shows how to solve a problem that I got wrong, I try to figure out where the teacher's solution differs from mine.

PS 25 Even people who are good at math make many unsuccessful attempts when solving challenging math problems.

PS 26 After I have gotten an answer to a homework problem, I use at least one way to make sure that the answer is correct.

PS 29 The first thing I do when solving a story problem is search for a formula that relates to the problem.

PS 31 For me, solving math problems in more than one way helps develop my reasoning skills.

PS 32 When I experience difficulty while studying math, I try hard to figure it out on my own.

PS 68 First thing story problem, draw picture

Talent (α = .564)— Added to the Fall 2009 Survey

Adapted from the VAMS, these items measure students' perceptions that talent is needed for succeeding in mathematics.

TL 35 Learning math requires a special talent.

TL 36 In order to solve math problems, I need to have seen the solution to a similar problem before.

TL 46 For me, doing well in a math course depends on how well the teacher explains things in class.

Effort (α = .545)—Added to the Fall 2009 Survey

Adapted from the VAMS, these items measure students' perception that effort is needed for succeeding in mathematics

ET 3 Learning math requires serious effort.

ET 7 For me, doing well in a math course depends on how much effort I put into studying.

ET 21 When I experience difficulty while studying math, I immediately seek help from other people.

Demographic Questions

1. Gender (circle one): Female Male

2. Age (circle one): 18-21 22-25 26-35 36-45 46-55 Over 55

3. Marital Status (circle one): Single Married In a marriage-like relationship Divorced Widowed

4. Are you a primary caregiver for any children or other family members? Yes No

If yes, how many? _____

5. What is your ethnicity?

- ☐ African American/Black
- ☐ Asian American
- ☐ Hispanic/Latino(a)
- ☐ Native American
- ☐ White
- ☐ Other

6. During the semester, how many hours do you typically work at a job per week? (circle one)

0 hours/Not employed 1-10 11-20 21-30 31-40 Over 40 hours

7. What is the highest level of education that you have completed? (check one)

- ☐ Completed less than high school.
- ☐ High school diploma.
- ☐ Associate's/two-year degree.
- ☐ Bachelor's/four-year or professional degree.
- ☐ Master's degree or higher.

8. What are your educational goals? (check all that apply)

- ☐ Obtain a GED.
- ☐ Obtain an Associate's/two-year degree.
- ☐ Transfer to a four-year college/university.
- ☐ Technical certificate.

□ Career change.
□ Personal enrichment.

9. Indicate which of the following are sources you use to pay your tuition at this college by checking *not a source, minor source,* or *major source* in the following columns.

	Not a source	Minor source	Major source
My own income/savings	□	□	□
Parents/spouse income or savings	□	□	□
Employer contributions	□	□	□
Grants & scholarships	□	□	□
Student loans	□	□	□
Public assistance	□	□	□

10. How many different math courses have you taken *in college*? (check one)

□ This is my first □ 1-2 prior courses □ 3 or more prior courses.

11. Have you had to repeat any math courses in college? Yes No

12. How would you rate your past experience with math on a scale from 1 (very negative) to 5 (very positive)?

	Very negative		Neutral		Very positive
In high school or before:	1	2	3	4	5
In college:	1	2	3	4	5