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Supplementary Materials for

Reducing achievement gaps in undergraduate general chemistry could lift underrepresented students into a "hyperpersistent zone"

R. B. Harris, M.R. Mack, J. Bryant, E. J. Theobald, S. Freeman*

*Corresponding author. Email: srf991@uw.edu

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- *Course grade*. We excluded students who took hardship withdrawals or exercised the credit/no-credit grading option.
- *Total SAT score*. When possible, we used SAT scores. However, 8.25% of students only took the ACT, in which case we converted ACT scores to SAT scores using concordance tables published by the College Board. If students took college entrance exams multiple times, we used the highest scores obtained.
- *Rank*. The University of Washington hires instructors of record in chemistry in one of three categories: 1) Tenure-track faculty who are hired and promoted primarily on the basis of their research productivity, 2) Lecturers who are not eligible for tenure but have full-time, often multi-year appointments and who are hired and promoted solely on the basis of teaching responsibilities, and 3) Temporary and often part-time instructors who are hired to teach one or two sections of a course in one or two quarters only.
- *Student evaluation of teaching scores (SETs)*. For each instructor in each section, we used the composite score calculated by the University's Office of Educational Assessment from four sub-scores recorded in the UW's standard end-of-course student evaluation of teaching form. This score is intended to be an overall indicator of students' assessment of the quality of the course and instruction.

Missing data and sample sizes

Of the 25,768 unique students included in our dataset, 1.15% were missing URM status, 0% were missing EOP status, 0.03% were missing binary gender status, and 0.6% were missing parental education information.

For calculations using binary gender status, there were 72,906 observations which constituted 24,800 unique students. For calculations using URM status, there were 70,542 observations constituting 23,992 unique students. For calculations using FGN status, there were 71,696 observations constituting 24,382 unique students. For calculations using SES status, there were 72,965 observations constituting 24,821 unique students.

Table S1. **Description of the final dataset.**

Data field	Short ID	Description	Range of values	Example
Course Data				
Course year	Year	Numeric field indicating the year the course was taken	2001-2016	2013
Course quarter	Quarter	Numeric field indicating the quarter the course was taken	1 = winter; 2 = spring; 3 = summer; 4 = autumn	1
Course section	Section	Character field indicating the particular section of a course taken	< unique combination of course code, section, year, quarter >	CHEM.120_A_2013_1
Student Data				
Student number	Student	Unique student identifier	< all unique >	123456
Socioeconomic status	SES	Binary field indicating student's SES status	0 = Higher-SES; 1 = Low-SES	0
Underrepresented minority	URM	Binary field indicating student's URM status.	0 = non-URM; 1 = URM student	1
First-generation student	FGN	Binary field indicating student's first-generation status	0 = nonFGN; 1 = FGN student	1
Gender	Gender	Binary field indicating student's gender.	0 = male; 1= female	0
Course grade	Grade	Field indicating the grade earned in a particular course.	numeric grade on 4.0 scale	3.5
			withdrawal, can be ‘normal’ or ‘hardship’ withdrawal	‘W’
			credit/no-credit option	S
Total SAT score	SATtotal	Numeric field indicating the student's combined math and verbal SAT scores.	0-1600	1420
Instructor Data				
Name	Instructor	Character field with instructor name	<unique identifiers>	John Smith
Rank	Rank	Character field with instructor rank	Professor, Lecturer, or Temp	Temp
Gender	Gender	Binary field with instructor gender	0 = male; 1= female	0
Student evaluation scores	SET	Numeric field giving average student evaluation score for a given course	1.9-5.2	3.6
Teaching Award	Award	Binary field indicating whether instructor has ever received the 'UW Distinguished Teaching Award'	0 = has not received; 1 = has received	0

Supplementary analyses

Achievement gap models

Fig. S1 reports raw achievement gaps and achievement gaps controlled for SAT and high school GPA ("HSGPA" in the figure), for all four student subgroups and all six courses included in this study. A value of 0.0 indicates no difference in final course grade between the students of interest and the appropriate comparison group (e.g. women versus men). Notches in the box plots indicate 95% confidence intervals. The data in the "GenChem.1" panel of fig. S1 are also reported in Fig. 1. The means and standard deviations for all four student subgroups and six courses analyzed are reported in table S2A, with coefficients for models for all four student subgroups and all six courses reported in table S2B.

The data in Fig. S1 suggest that there is a fundamental change in the nature of the gendered gap in general chemistry versus organic chemistry. The two course series are considered conceptually distinct, with general chemistry being more quantitative and theory-driven and organic chemistry emphasizing the three-dimensional relationships of atoms and the impact of spatial relationships on reaction mechanisms. If so, then well-documented gendered differences in spatial reasoning performance may help explain why gendered gaps are higher in organic chemistry (40). In preliminary support of this hypothesis, we note that gendered gaps also widen in the third course in the general chemistry sequence, which features several topics that rely heavily on spatial reasoning: molecular orbital theory, hybrid orbital theory, and an introduction to organic chemistry. If the hypothesis is supported by additional work, the result would promote the use of interventions to boost spatial reasoning skills in women.

We can propose three non-mutually exclusive hypotheses to explain the observation that URM and EOP students underperform in general chemistry but perform at or above their predicted level in organic chemistry: 1) URM and EOP students have learned how to cope with the emotional and psychological causes of underperformance by the time they get to organic chemistry; 2) the students who struggle the most with those emotional and psychological causes in general chemistry are no longer in the dataset by the time students get to organic; or 3) our indices of academic preparation in high school "decay" and become less predictive over time. All three hypotheses deserve testing.

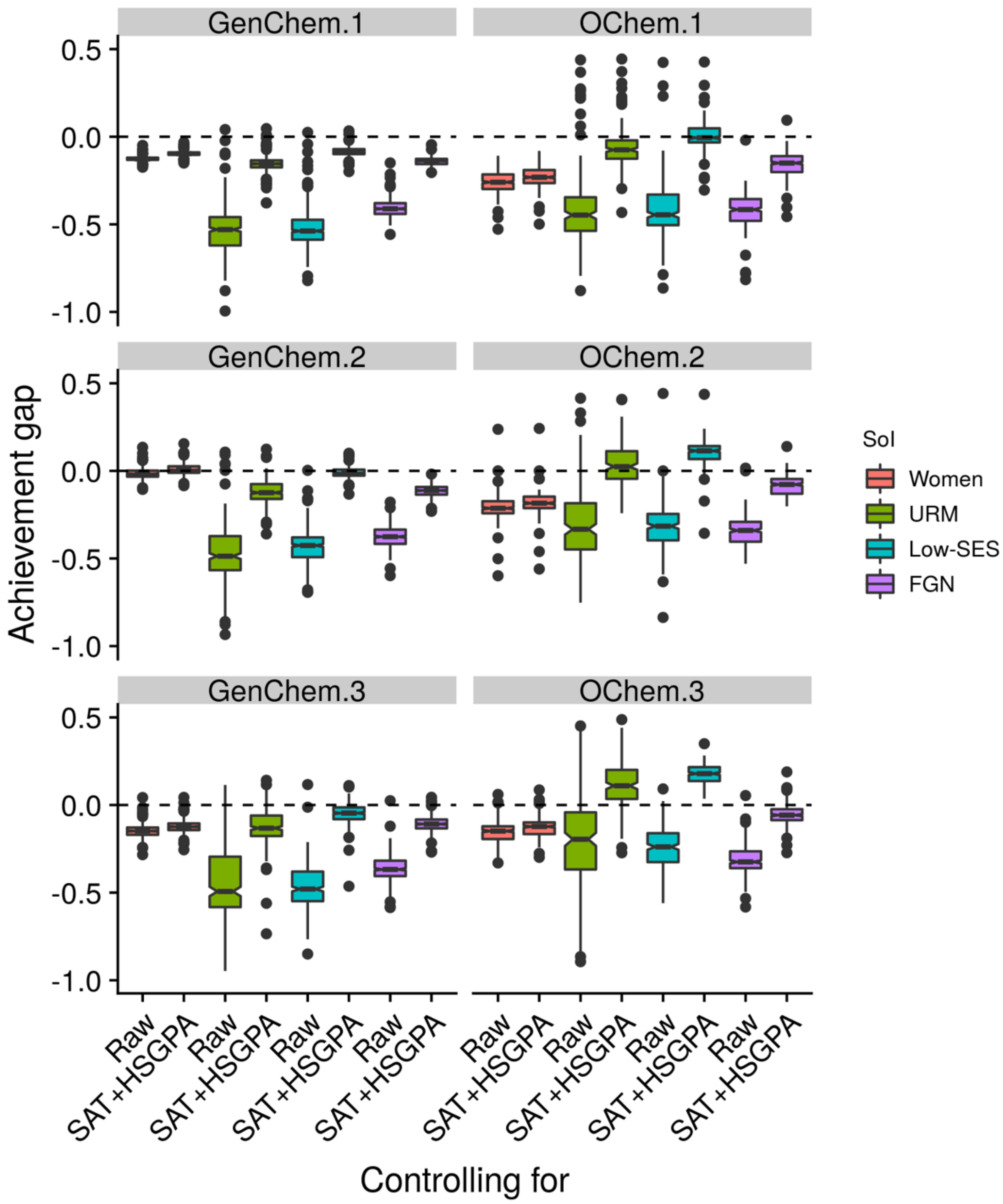

Fig. S1. Achievement gaps by student subgroup in GenChem and OChem.

In the legend, "SoI" stands for Student of Interest.

Table S2. Summary data from achievement gaps analyses.

A. Means and standard deviations (in parentheses) of achievement gaps shown in fig. S1. The coefficients used to calculate these achievement gaps are shown in table S2b.

Data	Course	Women	URM	Low-SES	FGN
Raw	GenChem1	-0.125 (0.018)	-0.536 (0.173)	-0.512 (0.137)	-0.403 (0.06)
	GenChem2	-0.011 (0.038)	-0.481 (0.206)	-0.439 (0.127)	-0.375 (0.072)
	GenChem3	-0.144 (0.05)	-0.497 (0.253)	-0.482 (0.165)	-0.361 (0.093)
	OChem1	-0.265 (0.069)	-0.395 (0.307)	-0.411 (0.237)	-0.429 (0.124)
	OChem2	-0.209 (0.107)	-0.328 (0.283)	-0.329 (0.209)	-0.331 (0.107)
	OChem3	-0.144 (0.075)	-0.228 (0.309)	-0.252 (0.14)	-0.315 (0.108)
SAT + HSGPA	GenChem1	-0.096 (0.02)	-0.157 (0.06)	-0.084 (0.031)	-0.138 (0.027)
	GenChem2	0.011 (0.037)	-0.125 (0.081)	-0.013 (0.037)	-0.115 (0.037)
	GenChem3	-0.12 (0.05)	-0.134 (0.13)	-0.057 (0.075)	-0.107 (0.058)
	OChem1	-0.236 (0.068)	-0.05 (0.157)	0.005 (0.109)	-0.164 (0.084)
	OChem2	-0.183 (0.102)	0.022 (0.158)	0.092 (0.102)	-0.078 (0.067)
	OChem3	-0.119 (0.072)	0.1 (0.149)	0.171 (0.066)	-0.057 (0.078)

B. Coefficients for all achievement gap models. These coefficients were used to calculate the achievement gaps detailed above in Table S2a and are plotted in Fig 1.

Variable	Raw				SAT+HSGPA			
	Estimate	S.E.	*t*-value	*p*-value	Estimate	S.E.	*t*-value	*p*-value
Gender Comparison								
Intercept	0.05	0.02	3.43	0.001	0.04	0.02	2.52	0.012
Gender	-0.13	0.01	-9.42	< 2e-16	-0.10	0.01	-7.91	2.60e-15
GenChem-2	-0.18	0.02	-8.77	< 2e-16	-0.18	0.02	-7.89	2.28e-14
GenChem-3	-0.23	0.02	-10.34	< 2e-16	-0.23	0.02	-9.49	< 2e-16
OChem-1	-0.26	0.02	-10.54	< 2e-16	-0.26	0.03	-9.99	< 2e-16
OChem-2	-0.34	0.03	-13.37	< 2e-16	-0.34	0.03	-12.54	< 2e-16
OChem-3	-0.40	0.02	-15.84	< 2e-16	-0.40	0.03	-14.77	< 2e-16
Gender*GenChem-2	0.09	0.01	7.39	1.54e-13	0.09	0.01	66.47	< 2e-16
Gender*GenChem-3	-0.03	0.01	-2.23	0.026	-0.04	0.01	53.10	< 2e-16
Gender*OChem-1	-0.14	0.02	-8.76	< 2e-16	-0.14	0.02	7.02	2.28e-12
Gender*OChem-2	-0.10	0.02	-5.66	1.51e-08	-0.10	0.02	-2.60	0.009
Gender*OChem-3	-0.03	0.02	-1.82	0.068	-0.04	0.02	-8.96	< 2e-16
SAT	NA	NA	NA	NA	0.002	0.0	-5.87	4.48e-09
HSGPA	NA	NA	NA	NA	0.29	0.0	-2.07	0.038
URM Comparison								
Intercept	0.04	0.01	2.93	0.003	0.01	0.01	0.46	0.65
URM	-0.56	0.02	-24.74	< 2e-16	-0.16	0.02	-7.93	2.27e-15
GenChem-2	-0.13	0.02	-6.58	1.69e-10	-0.13	0.02	-5.97	5.33e-09
GenChem-3	-0.25	0.02	-11.95	< 2e-16	-0.25	0.02	-11.00	< 2e-16
OChem-1	-0.34	0.02	-14.86	< 2e-16	-0.35	0.02	-13.91	< 2e-16
OChem-2	-0.41	0.02	-16.83	< 2e-16	-0.41	0.03	-15.68	< 2e-16
OChem-3	-0.44	0.02	-18.46	< 2e-16	-0.44	0.03	-17.13	< 2e-16
URM*GenChem-2	0.03	0.02	1.34	0.179	0.02	0.02	1.15	0.252
URM*GenChem-3	0.01	0.02	0.52	0.600	0.01	0.02	0.41	0.685
URM*OChem-1	0.08	0.02	3.00	0.003	0.08	0.03	2.91	0.004
URM*OChem-2	0.16	0.03	5.28	1.32e-07	0.16	0.03	5.22	1.82e-07
URM*OChem-3	0.23	0.03	7.23	4.98e-13	0.23	0.03	7.21	5.5e-13
SAT	NA	NA	NA	NA	0.002	0.0	66.034	< 2e-16

HSGPA	NA	NA	NA	NA	0.27	0.0	50.364	< 2e-16
SES Comparison								
Intercept	0.09	0.01	6.35	4.71e-10	0.01	0.01	0.49	0.625
SES	-0.54	0.02	-31.57	< 2e-16	-0.08	0.02	-5.2	2.02e-07
GenChem-2	-0.15	0.02	-7.23	2.72e-12	-0.15	0.02	-6.66	8.99e-11
GenChem-3	-0.26	0.02	-12.17	< 2e-16	-0.26	0.02	-11.36	< 2e-16
OChem-1	-0.36	0.02	-15.21	< 2e-16	-0.36	0.02	-14.48	< 2e-16
OChem-2	-0.43	0.02	-17.77	< 2e-16	-0.44	0.03	-16.83	< 2e-16
OChem-3	-0.47	0.02	-19.78	< 2e-16	-0.47	0.02	-18.65	< 2e-16
SES*GenChem-2	0.08	0.02	4.84	1.28e-06	0.07	0.01	4.28	1.86e-05
SES*GenChem-3	0.05	0.02	2.64	0.008	0.04	0.02	2.00	0.045
SES*OChem-1	0.11	0.02	5.22	1.82e-07	0.09	0.02	4.66	3.14e-06
SES*OChem-2	0.22	0.02	10.14	< 2e-16	0.20	0.02	9.63	< 2e-16
SES*OChem-3	0.29	0.02	12.57	< 2e-16	0.27	0.02	12.07	< 2e-16
SAT	NA	NA	NA	NA	0.003	0.0	64.54	< 2e-16
HSGPA	NA	NA	NA	NA	0.28	0.0	51.52	< 2e-16
FGN Comparison								
Intercept	0.14	0.01	9.34	< 2e-16	0.04	0.02	2.50	0.013
FGN	-0.41	0.01	-29.01	< 2e-16	-0.14	0.01	-10.70	< 2e-16
GenChem-2	-0.14	0.02	-6.86	2.65e-11	-0.14	0.02	-6.28	8.76e-10
GenChem-3	-0.26	0.02	-12.1	< 2e-16	-0.26	0.02	-11.27	< 2e-16
OChem-1	-0.33	0.02	-13.97	< 2e-16	-0.34	0.02	-13.3	< 2e-16
OChem-2	-0.41	0.02	-16.71	< 2e-16	-0.42	0.03	-15.80	< 2e-16
OChem-3	-0.44	0.02	-18.32	< 2e-16	-0.45	0.03	-17.30	< 2e-16
FGN*GenChem-2	0.03	0.01	1.93	0.054	0.02	0.01	1.876	0.061
FGN*GenChem-3	0.03	0.01	2.01	0.045	0.03	0.01	2.036	0.042
FGN*OChem-1	0.00	0.02	-0.23	0.817	0.00	0.02	-0.112	0.911
FGN*OChem-2	0.07	0.02	3.81	0.0001	0.07	0.02	4.067	4.8e-05
FGN*OChem-3	0.09	0.02	4.84	1.30e-06	0.09	0.02	5.110	3.2e-07
SAT	NA	NA	NA	NA	0.002	0.0	62.150	< 2e-16
HSGPA	NA	NA	NA	NA	0.283	0.0	52.289	< 2e-16

Instructor characteristics as predictors of achievement gaps

Table S3A provides the regression coefficients for models where an instructor characteristic had a statistically significant impact on the size of achievement gaps. Table S3B provides model selection statistics for the instructor characteristics analysis.

Table S3. Summary data from instructor characteristics analyses.

A. Regression coefficients.

Comparison	Final model	Variable	Estimate	S.E.	*t*-value	*p*-value
URM vs. Non-URM	*Gap ~ Gender + (1|course)*	Intercept	-0.043	0.043	-1.001	0.36
		Gender	-0.02	0.010	-1.927	0.05
URM vs. Non-URM	*Gap ~ SET + (1|course)*	Intercept	0.039	0.053	0.727	0.48
		SET	-0.023	0.007	-3.03	0.003
URM vs. Non-URM	*Gap ~ Award + (1|course)*	Intercept	-0.043	0.043	-1.001	0.363
		Award	-0.034	0.013	-2.673	0.007
Low-SES vs. High-SES	*Gap ~ Award + (1|course)*	Intercept	0.024	0.039	0.62	0.562
		Award	-0.019	0.007	-2.685	0.007
FGN vs. Non-FGN	*Gap ~ Award + (1|course)*	Intercept	-0.106	0.015	-6.816	0.001
		Award	-0.015	0.006	-2.412	0.012

B. Model selection statistics. "Step" refers to the sequence in stepwise selection. SoI stands for Students of Interest. In the columns that specify models, variables that follow the form (1|StudentNo) indicate a random effect, with all other terms being fixed effects. "AICc" is the value of the Akaike Information Criterion with the small-sample size correction; "delta" indicates the magnitude of the difference between the model in the row and the model with the smallest AICc. Other terms are explained in the text.

Instr. trait	Full model	Step	SoI	Model	df	logLik	AICc	delta	weight
Gender	Women's achievement gap ~ instructor gender + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	Women	~ instructor gender + (1 | instructor) + (1 | course)	5	750.18	-1490.2	0.00	0.44
		1	Women	~ instructor gender + (1 | instructor) + (1 | year) + (1 | course)	6	750.18	-1488.2	2.03	0.16
		2	Women	~ instructor gender + (1 | instructor) + (1 | course)	5	756.77	-1503.4	0.00	1.00
		2	Women	~ instructor gender	3	469.53	-933.0	570.42	0.00
		3	**Women**	**~ 1 + (1 | course) + (1 | instructor)**	**4**	**754.09**	**-1500.1**	**0.00**	**0.99**
		3	Women	~ instructor gender + (1 | course) + (1 | instructor)	5	750.18	-1490.2	9.86	0.01
	URM's achievement gap ~ instructor gender + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	URM	~ instructor gender + (1 | instructor) + (1 | course)	5	366.62	-723.1	0.00	0.20
		1	URM	~ instructor gender + (1 | instructor) + (1 | course) + (1 | quarter)	6	367.50	-722.8	0.28	0.17
		1	URM	~ instructor gender + (1 | instructor) + (1 | year) + (1 | course)	6	367.46	-722.7	0.37	0.16
		1	URM	(1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)~ instructor gender +	7	368.43	-722.6	0.50	0.15
		1	URM	~ instructor gender + (1 | year) + (1 | course)	5	366.03	-721.9	1.18	0.11
		1	URM	~ instructor gender + (1 | course)	4	364.74	-721.4	1.72	0.08
		1	URM	~ instructor gender + (1 | year) + (1 | course) + (1 | quarter)	6	366.62	-721.1	2.05	0.07
		2	URM	~ instructor gender + (1 | course)	4	370.58	-733.1	0.00	1.00
		2	URM	~ instructor gender	3	259.80	-513.6	219.53	0.00
		3	**URM**	**~ instructor gender + (1 | course)**	**4**	**364.74**	**-721.4**	**0.00**	**1.00**
	LowSES's achievement gap ~ instructor gender + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	LowSES	~ instructor gender + (1 | course)	4	671.52	-1334.9	0.00	0.32
		1	LowSES	~ instructor gender + (1 | instructor) + (1 | course)	5	672.13	-1334.1	0.82	0.21
		1	LowSES	~ instructor gender + (1 | course) + (1 | quarter)	5	671.56	-1333.0	1.96	0.12
		1	LowSES	~ instructor gender + (1 | year) + (1 | course)	5	671.52	-1332.9	2.03	0.12
		2	LowSES	~ instructor gender + (1 | course)	4	678.05	-1348.0	0.00	1.00
		2	LowSES	~ instructor gender	3	429.96	-853.9	494.15	0.00
		3	**LowSES**	**~ 1 + (1 | course)**	**3**	**673.83**	**-1341.6**	**0.00**	**0.97**
		3	LowSES	~ instructor gender + (1 | course)	4	671.52	-1334.9	6.66	0.03
	FGN's achievement gap ~ instructor gender + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	FGN	~ instructor gender + (1 | course)	4	721.00	-1433.9	0.00	0.37
		1	FGN	~ instructor gender + (1 | instructor) + (1 | course)	5	721.22	-1432.3	1.61	0.17
		1	FGN	~ instructor gender + (1 | course) + (1 | quarter)	5	721.00	-1431.9	2.04	0.13
		2	FGN	~ instructor gender + (1 | course)	4	728.54	-1449.0	0.00	1.00
		2	FGN	~ instructor gender	3	664.28	-1322.5	126.49	0.00
		3	**FGN**	**~ 1 + (1 | course)**	**3**	**724.35**	**-1442.7**	**0.00**	**0.99**
		3	FGN	~ instructor gender + (1 | course)	4	721.00	-1433.9	8.74	0.01
		1	Women	~ instructor award + (1 | instructor) + (1 | course)	5	823.89	-1637.7	0.00	0.44

Teaching Award	Women's achievement gap ~ instructor award + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	Women	~ instructor award + (1 | instructor) + (1 | year) + (1 | course)	6	823.92	-1635.7	1.98	0.16
		1	Women	~ instructor award + (1 | instructor) + (1 | course) + (1 | quarter)	6	823.890092	-1635.606988	2.049739086	0.16
		2	Women	~ instructor award + (1 | course) + (1 | instructor)	5	830.3934513	-1650.663446	0	1.00
		2	Women	~ instructor award	3	489.81	-973.6	677.09	0.00
		3	**Women**	**~ 1 + (1 | course) + (1 | instructor)**	**4**	**827.69**	**-1647.3**	**0.00**	**0.99**
		3	Women	~ instructor award + (1 | course) + (1 | instructor)	5	823.89	-1637.7	9.65	0.01
	URM's achievement gap ~ instructor award + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	URM	~ instructor award + (1 | instructor) + (1 | course)	5	368.56	-727.0	0.00	0.23
		1	URM	~ instructor award + (1 | instructor) + (1 | year) + (1 | course)	6	369.31	-726.4	0.56	0.17
		1	URM	~ instructor award + (1 | instructor) + (1 | course) + (1 | quarter)	6	369.24	-726.3	0.69	0.16
		1	URM	~ instructor award + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	7	370.0858892	-725.935989	1.066241327	0.13
		1	URM	~ instructor award + (1 | year) + (1 | course)	5	367.8964137	-725.6670412	1.335189081	0.12
		1	URM	~ instructor award + (1 | course)	4	366.58	-725.1	1.93	0.09
		1	URM	~ instructor award + (1 | year) + (1 | course) + (1 | quarter)	6	368.32	-724.5	2.55	0.06
		2	URM	~ instructor award + (1 | course)	4	372.22	-736.4	0.00	1.00
		2	URM	~ instructor award	3	254.14	-502.2	234.13	0.00
		3	**URM**	**~ instructor award + (1 | course)**	**4**	**366.58**	**-725.1**	**0.00**	**1.00**
	LowSES's achievement gap ~ instructor award + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	LowSES	~ instructor award + (1 | course)	4	673.73	-1339.4	0.00	0.36
		1	LowSES	~ instructor award + (1 | instructor) + (1 | course)	5	674.07	-1338.0	1.36	0.18
		1	LowSES	~ instructor award + (1 | year) + (1 | course)	5	673.73	-1337.3	2.04	0.13
		2	LowSES	~ instructor award + (1 | course)	4	680.07	-1352.1	0.00	1.00
		2	LowSES	~ instructor award	3	422.74	-839.4	512.64	0.00
		3	**LowSES**	**~ instructor award + (1 | course)**	**4**	**673.73**	**-1339.4**	**0.00**	**1.00**
	FGN's achievement gap ~ instructor award + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	FGN	~ instructor award + (1 | course)	4	723.44	-1438.8	0.00	0.40
		1	FGN	~ instructor award + (1 | instructor) + (1 | course)	5	723.46	-1436.8	2.01	0.15
		2	FGN	~ instructor award + (1 | course)	4	730.80	-1453.5	0.00	1.00
		2	FGN	~ instructor award	3	668.47	-1330.9	122.63	0.00
		3	**FGN**	**~ instructor award + (1 | course)**	**4**	**723.44**	**-1438.8**	**0.00**	**1.00**
Rank	Women's achievement gap ~ instructor rank + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	Women	~ instructor rank + (1 | instructor) + (1 | course)	6	746.99	-1481.8	0.00	0.39
		1	Women	~ instructor rank + (1 | course)	5	744.96	-1479.8	1.99	0.15
		1	Women	~ instructor rank + (1 | instructor) + (1 | year) + (1 | course)	7	747.01	-1479.8	2.02	0.14
		2	Women	~ instructor rank + (1 | course)	5	755.82	-1501.5	0.00	1.00

		2	Women	~ instructor rank	4	468.74	-929.4	572.13	0.00
		3	**Women**	**~ 1 + (1 | course)**	**3**	**750.86**	**-1495.7**	**0.00**	**1.00**
		3	Women	~ instructor rank + (1 | course)	5	744.96	-1479.8	15.87	0.00
	URM's achievement gap ~ instructor rank + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	URM	~ instructor rank + (1 | year) + (1 | course)	6	364.35	-716.5	0.00	0.17
		1	URM	~ instructor rank + (1 | instructor) + (1 | course)	6	364.28	-716.4	0.15	0.15
		1	URM	~ instructor rank + (1 | instructor) + (1 | year) + (1 | course)	7	365.30	-716.4	0.16	0.15
		1	URM	~ instructor rank + (1 | instructor) + (1 | course) + (1 | quarter)	7	365.13	-716.0	0.52	0.13
		1	URM	~ instructor rank + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	8	366.12	-715.9	0.59	0.12
		1	URM	~ instructor rank + (1 | course)	5	362.96	-715.8	0.74	0.11
		1	URM	~ instructor rank + (1 | year) + (1 | course) + (1 | quarter)	7	364.84	-715.4	1.09	0.10
		1	URM	~ instructor rank + (1 | course) + (1 | quarter)	6	363.43	-714.7	1.86	0.07
		1	URM	~ instructor rank + (1 | instructor) + (1 | quarter)	6	313.60	-615.0	101.50	0.00
		2	URM	~ instructor rank + (1 | course)	5	372.08	-734.0	0.00	1.00
		2	URM	~ instructor rank	4	260.64	-513.2	220.85	0.00
		3	**URM**	**~ 1 + (1 | course)**	**3**	**366.27**	**-726.5**	**0.00**	**1.00**
		3	URM	~ instructor rank + (1 | course)	5	362.96	-715.8	10.68	0.00
	LowSES's achievement gap ~ instructor rank + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	LowSES	~ instructor rank + (1 | course)	5	670.62	-1331.1	0.00	0.37
		1	LowSES	~ instructor rank + (1 | instructor) + (1 | course)	6	670.85	-1329.5	1.59	0.17
		1	LowSES	~ instructor rank + (1 | course) + (1 | quarter)	6	670.64	-1329.1	2.00	0.14
		2	LowSES	~ instructor rank + (1 | course)	5	681.04	-1352.0	0.00	1.00
		2	LowSES	~ instructor rank	4	434.51	-860.9	491.03	0.00
		3	**LowSES**	**~ 1 + (1 | course)**	**3**	**673.83**	**-1341.6**	**0.00**	**0.99**
		3	LowSES	~ instructor rank + (1 | course)	5	670.62	-1331.1	10.49	0.01
	FGN's achievement gap ~ instructor rank + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	FGN	~ instructor rank + (1 | course)	5	718.62	-1427.1	0.00	0.39
		1	FGN	~ instructor rank + (1 | instructor) + (1 | course)	6	718.67	-1425.2	1.93	0.15
		1	FGN	~ instructor rank + (1 | year) + (1 | course)	6	718.62	-1425.1	2.05	0.14
		2	FGN	~ instructor rank + (1 | course)	5	730.12	-1450.1	0.00	1.00
		2	FGN	~ instructor rank	4	665.86	-1323.6	126.48	0.00
		3	**FGN**	**~ 1 + (1 | course)**	**3**	**724.35**	**-1442.7**	**0.00**	**1.00**
		3	FGN	~ instructor rank + (1 | course)	5	718.62	-1427.1	15.55	0.00
SETs	Women's achievement gap ~ student evaluations + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	Women	~ student evaluations + (1 | course)	4	632.43	-1256.8	0.00	0.30
		1	Women	~ student evaluations + (1 | instructor) + (1 | course)	5	633.16	-1256.2	0.59	0.22
		1	Women	~ student evaluations + (1 | year) + (1 | course)	5	632.60	-1255.0	1.72	0.13
		1	Women	~ student evaluations + (1 | course) + (1 | quarter)	5	632.43	-1254.7	2.05	0.11

		2	Women	~ student evaluations + (1 | course)	4	639.51	-1270.9	0.00	1.00
		2	Women	~ student evaluations	3	394.23	-782.4	488.53	0.00
		3	**Women**	**~ 1 + (1 | course)**	**3**	**635.90**	**-1265.7**	**0.00**	**0.99**
		3	Women	~ student evaluations + (1 | course)	4	632.43	-1256.8	8.98	0.01
	URM's achievement gap ~ student evaluations + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	URM	~ student evaluations + (1 | course)	4	352.38	-696.7	0.00	0.22
		1	URM	~ student evaluations + (1 | instructor) + (1 | course) + (1 | quarter)	6	354.23	-696.3	0.41	0.18
		1	URM	~ student evaluations + (1 | course) + (1 | quarter)	5	353.17	-696.2	0.48	0.17
		1	URM	~ student evaluations + (1 | instructor) + (1 | course)	5	353.03	-695.9	0.75	0.15
		1	URM	~ student evaluations + (1 | year) + (1 | course)	5	352.49	-694.8	1.84	0.09
		1	URM	~ student evaluations + (1 | year) + (1 | course) + (1 | quarter)	6	353.42	-694.6	2.04	0.08
		2	URM	~ student evaluations + (1 | course)	4	358.57	-709.0	0.00	1.00
		2	URM	~ student evaluations	3	235.89	-465.7	243.32	0.00
		3	**URM**	**~ student evaluations + (1 | course)**	**4**	**352.38**	**-696.7**	**0.00**	**0.52**
		3	URM	~ 1 + (1 | course)	3	351.27	-696.5	0.18	0.48
	LowSES's achievement gap ~ student evaluations + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	LowSES	~ student evaluations + (1 | course)	4	569.70	-1131.3	0.00	0.32
		1	LowSES	~ student evaluations + (1 | instructor) + (1 | course)	5	570.37	-1130.6	0.71	0.22
		1	LowSES	~ student evaluations + (1 | course) + (1 | quarter)	5	569.70	-1129.3	2.05	0.11
		2	LowSES	~ student evaluations + (1 | course)	4	576.44	-1144.8	0.00	1.00
		2	LowSES	~ student evaluations	3	350.63	-695.2	449.60	0.00
		3	**LowSES**	**~ 1 + (1 | course)**	**3**	**572.81**	**-1139.6**	**0.00**	**0.98**
		3	LowSES	~ student evaluations + (1 | course)	4	569.70	-1131.3	8.26	0.02
	FGN's achievement gap ~ student evaluations + (1 | instructor) + (1 | year) + (1 | course) + (1 | quarter)	1	FGN	~ student evaluations + (1 | course)	4	619.33	-1230.6	0.00	0.40
		1	FGN	~ student evaluations + (1 | instructor) + (1 | course)	5	619.36	-1228.6	1.99	0.15
		1	FGN	~ student evaluations + (1 | year) + (1 | course)	5	619.33	-1228.5	2.05	0.14
		2	FGN	~ student evaluations + (1 | course)	4	627.06	-1246.0	0.00	1.00
		2	FGN	~ student evaluations	3	561.90	-1117.7	128.27	0.00
		3	**FGN**	**~ 1 + (1 | course)**	**3**	**622.52**	**-1239.0**	**0.00**	**0.99**
		3	FGN	~ student evaluations + (1 | course)	4	619.33	-1230.6	8.42	0.01

The small-to-negligible impact of instructor gender on achievement gaps reported here was surprising, as other work in STEM has shown a slight but significant impact of instructor gender on gendered gaps. The lack of correspondence between SETs and achievement gaps that we observed has been well-documented in the literature, however (*33*). Extensive data on bias in SETs based on instructor gender and lack of correlation with student learning have inspired calls to abandon student evaluations of teaching in favor of evidence-based approaches (*33*).

Risk and attrition models

The risk of not continuing for each course in GenChem and OChem, along with attrition over time, are reported for each student subgroup in Fig. 2. Fig. S2 plots the same results, but from models that do not control for indices of academic preparation and ability (SAT and high school GPA). Table S4 provides fitted hazard and survival probability estimates without and with controls for student preparation and ability, along with regression coefficients for both models.

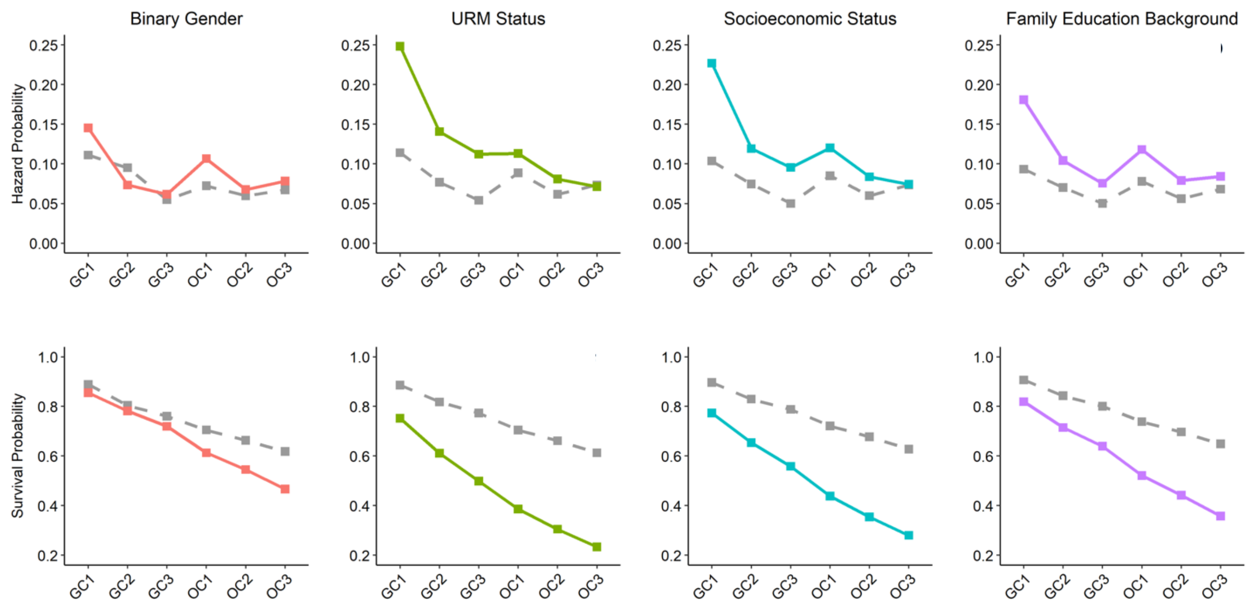

Fig. S2. Risk by course and survival over time, not controlling for academic preparation. The top graph shows the actual or raw proportion of students at the beginning of each general chemistry (GC) or organic chemistry (OC) course who did not advance to the subsequent course. The bottom graph shows the actual or raw proportion of original students retained at the end of each course. In both panels, underrepresented students are represented by bold lines and well-represented students by grayed lines.

Table S4. Summary data from risk and survival analyses.

A. Fitted hazard and survival probability estimates with 95% confidence intervals, in brackets.

Binary Gender				
Course	**Hazard**		**Survival**	
	Men	**Women**	**Men**	**Women**
GenChem-1	.11, [.10, .12]	.15, [.13, .16]	.89, [.88, .90]	.85, [.84, .87]
GenChem-2	.10, [.08, .11]	.07, [.06, .09]	.80, [.80, .82]	.78, [.77, .80]
GenChem-3	.05, [.04, .07]	.06, [.05, .08]	.76, [.75, .78]	.72, [.71, .74]
OChem-1	.07, [.06, .09]	.11, [.08, .14]	.71, [.70, .72]	.61, [.60, .64]
OChem-2	.06, [.05, .08]	.07, [.05, .09]	.66, [.66, .68]	.55, [.54, .57]
OChem-3	.07, [.05, .09]	.08, [.06, .11]	.62, [.62, .64]	.47, [.46, .49]
URM Status				
Course	**Hazard**		**Survival**	
	Non-URM	**URM**	**Non-URM**	**URM**
GenChem-1	.11, [.10, .13]	.25, [.22, .28]	.89, [.87, .90]	.75, [.72, .78]
GenChem-2	.08, [.06, .09]	.14, [.11, .18]	.82, [.81, .83]	.61, [.59, .65]
GenChem-3	.05, [.04, .07]	.11, [.08, .15]	.77, [.77, .79]	.50, [.49, .53]
OChem-1	.09, [.07, .11]	.11, [.08, .16]	.70, [.70, .72]	.39, [.38, .42]
OChem-2	.06, [.05, .08]	.08, [.05, .12]	.66, [.66, .68]	.30, [.30, .33]
OChem-3	.07, [.06, .09]	.07, [.04, .11]	.61, [.61, .63]	.23, [.23, .26]
Socioeconomic Status				
Course	**Hazard**		**Survival**	
	High-SES	**Low-SES**	**High-SES**	**Low-SES**
GenChem-1	.10, [.09, .11]	.23, [.20, .25]	.90, [.89, .91]	.77, [.75, .80]
GenChem-2	.07, [.06, .09]	.12, [.09, .15]	.83, [.82, .84]	.65, [.64, .68]
GenChem-3	.05, [.04, .06]	.10, [.07, .12]	.79, [.78, .80]	.56, [.54, .59]
OChem-1	.09, [.07, .10]	.12, [.09, .16]	.72, [.72, .74]	.44, [.43, .47]
OChem-2	.06, [.05, .07]	.08, [.06, .12]	.68, [.67, .70]	.35, [.35, .38]
OChem-3	.07, [.06, .09]	.07, [.05, .11]	.63, [.63, .65]	.28, [.28, .30]
Family Education Background				
Course	**Hazard**		**Survival**	
	Cont.-Gen.	**First-Gen.**	**Cont.-Gen.**	**First-Gen.**
GenChem-1	.09, [.08, .10]	.18, [.16, .20]	.91, [.90, .92]	.82, [.80, .84]
GenChem-2	.07, [.06, .08]	.10, [.08, .13]	.84, [.83, .86]	.71, [.70, .74]
GenChem-3	.05, [.04, .06]	.08, [.06, .10]	.80, [.79, .81]	.64, [.63, .67]
OChem-1	.08, [.06, .10]	.12, [.09, .15]	.74, [.73, .75]	.52, [.51, .55]
OChem-2	.06, [.04, .07]	.08, [.06, .11]	.70, [.69, .71]	.44, [.44, .47]
OChem-3	.07, [.05, .09]	.08, [.06, .12]	.65, [.65, .67]	.36, [.35, .38]

B. Fitted hazard and survival probability estimates, adjusted for indices of academic preparation and ability.

C. Binary Gender				
Course	Hazard		Survival	
	Men	Women	Men	Women
GenChem-1	.07, [.06, .08]	.10, [.08, .11]	.93, [.92, .94]	.90, [.89, .92]
GenChem-2	.07, [.06, .09]	.06, [.04, .07]	.86, [.86, .87]	.85, [.84, .86]
GenChem-3	.05, [.04, .06]	.05, [.04, .07]	.82, [.82, .84]	.80, [.78, .81]
OChem-1	.07, [.05, .09]	.10, [.08, .14]	.77, [.76, .78]	.69, [.68, .72]
OChem-2	.06, [.05, .08]	.07, [.05, .10]	.72, [.72, .74]	.62, [.62, .65]
OChem-3	.07, [.05, .09]	.09, [.06, .13]	.67, [.67, .69]	.53, [.53, .56]
URM Status				
Course	Hazard		Survival	
	Non-URM	URM	Non-URM	URM
GenChem-1	.08, [.07, .09]	.12, [.10, .14]	.92, [.91, .93]	.88, [.86, .90]
GenChem-2	.06, [.05, .07]	.08, [.06, .10]	.86, [.85, .87]	.80, [.79, .83]
GenChem-3	.05, [.04, .06]	.07, [.05, .10]	.82, [.81, .83]	.73, [.72, .76]
OChem-1	.09, [.07, .11]	.08, [.06, .12]	.75, [.75, .77]	.65, [.64, .68]
OChem-2	.06, [.05, .08]	.06, [.04, .10]	.70, [.70, .72]	.59, [.58, .61]
OChem-3	.08, [.06, .10]	.06, [.04, .10]	.64, [.64, .66]	.53, [.52, .55]
Socioeconomic Status				
Course	Hazard		Survival	
	High-SES	Low-SES	High-SES	Low-SES
GenChem-1	.08, [.07, .09]	.10, [.09, .12]	.92, [.91, .93]	.90, [.88, .91]
GenChem-2	.06, [.05, .08]	.06, [.05, .08]	.86, [.85, .87]	.83, [.82, .85]
GenChem-3	.05, [.04, .06]	.06, [.04, .08]	.82, [.81, .83]	.78, [.77, .80]
OChem-1	.09, [.07, .11]	.08, [.06, .11]	.75, [.74, .76]	.70, [.69, .72]
OChem-2	.07, [.05, .08]	.06, [.04, .09]	.70, [.69, .71]	.63, [.63, .66]
OChem-3	.09, [.07, .11]	.06, [.04, .09]	.64, [.64, .66]	.57, [.57, .60]
Family Education Background				
Course	Hazard		Survival	
	Cont.-Gen.	First-Gen.	Cont.-Gen.	First-Gen.
GenChem-1	.07, [.06, .08]	.11, [.09, .12]	.93, [.92, .94]	.89, [.88, .91]
GenChem-2	.06, [.05, .07]	.07, [.05, .09]	.87, [.86, .88]	.83, [.81, .84]
GenChem-3	.05, [.04, .06]	.05, [.04, .07]	.83, [.82, .84]	.77, [.76, .79]
OChem-1	.08, [.07, .10]	.10, [.07, .13]	.76, [.76, .78]	.67, [.66, .69]
OChem-2	.06, [.05, .08]	.07, [.05, .10]	.71, [.71, .73]	.60, [.59, .62]
OChem-3	.08, [.06, .10]	.08, [.06, .11]	.66, [.65, .68]	.52, [.52, .54]

D. Coefficients for risk and attrition models, without controls for academic preparation and ability. SoI stands for Students of Interest.

Comparison	Variable	Estimate	S.E.	*z*-value	*p*-value
Binary Gender	Intercept	-2.575	0.071	-36.340	0.000
	GenChem-2	0.009	0.086	0.103	0.918
	GenChem-3	-0.478	0.105	-4.537	0.000
	OChem-1	-0.061	0.116	-0.532	0.595
	OChem-2	-0.188	0.128	-1.463	0.144
	OChem-3	-0.003	0.133	-0.019	0.985
	Gender	0.328	0.047	7.035	0.000
	Gender*GenChem-2	-0.592	0.077	-7.696	0.000
	Gender*GenChem-3	-0.178	0.101	-1.770	0.077
	Gender*OChem-1	0.159	0.103	1.538	0.124
	Gender*OChem-2	-0.137	0.123	-1.120	0.263
	Gender*OChem-3	-0.085	0.128	-0.666	0.505
	SAT	-0.629	0.022	-28.232	0.000
	HSGPA	-0.491	0.019	-25.813	0.000
URM Status	Intercept	-2.434	0.066	-37.084	0.000
	GenChem-2	-0.287	0.078	-3.691	0.000
	GenChem-3	-0.568	0.089	-6.380	0.000
	OChem-1	0.089	0.098	0.908	0.364
	OChem-2	-0.238	0.110	-2.162	0.031
	OChem-3	0.018	0.113	0.157	0.875
	URM	0.415	0.064	6.517	0.000
	URM*GenChem-2	-0.155	0.108	-1.438	0.151
	URM*GenChem-3	0.006	0.140	0.044	0.965
	URM*OChem-1	-0.464	0.164	-2.829	0.005
	URM*OChem-2	-0.415	0.200	-2.077	0.038
	URM*OChem-3	-0.761	0.230	-3.314	0.001
	SAT	-0.619	0.022	-27.504	0.000
	HSGPA	-0.460	0.019	-24.562	0.000
Socio-economic Status	Intercept	-2.439	0.065	-37.583	0.000
	GenChem-2	-0.229	0.079	-2.894	0.004
	GenChem-3	-0.559	0.091	-6.144	0.000
	OChem-1	0.121	0.099	1.222	0.222
	OChem-2	-0.193	0.111	-1.730	0.084
	OChem-3	0.085	0.113	0.752	0.452
	SES	0.276	0.053	5.229	0.000
	SES*GenChem-2	-0.317	0.088	-3.624	0.000
	SES*GenChem-3	-0.101	0.110	-0.916	0.360
	SES*OChem-1	-0.358	0.117	-3.049	0.002

	SES*OChem-2	-0.363	0.144	-2.524	0.012
	SES*OChem-3	-0.698	0.160	-4.371	0.000
	SAT	-0.617	0.023	-27.077	0.000
	HSGPA	-0.461	0.018	-25.088	0.000
Family Education Background	Intercept	-2.553	0.069	-37.128	0.000
	GenChem-2	-0.187	0.084	-2.241	0.025
	GenChem-3	-0.446	0.097	-4.616	0.000
	OChem-1	0.140	0.105	1.332	0.183
	OChem-2	-0.150	0.118	-1.264	0.206
	OChem-3	0.124	0.120	1.026	0.305
	FGN	0.410	0.047	8.725	0.000
	FGN*GenChem-2	-0.266	0.077	-3.438	0.001
	FGN*GenChem-3	-0.258	0.100	-2.592	0.010
	FGN*OChem-1	-0.197	0.101	-1.953	0.051
	FGN*OChem-2	-0.287	0.124	-2.308	0.021
	FGN*OChem-3	-0.422	0.130	-3.240	0.001
	SAT	-0.590	0.022	-26.218	0.000
	HSGPA	-0.475	0.019	-25.318	0.000

E. Coefficients for risk and attrition models, with controls for academic preparation and ability.

Variable	Estimate	S.E.	*z*-value	*p*-value
Binary Gender Comparison				
(Intercept)	-2.806	0.080	-35.020	0.000
GC2	-0.034	0.081	-0.414	0.679
GC3	-0.306	0.103	-2.975	0.003
OC1	0.157	0.114	1.376	0.169
OC2	-0.012	0.130	-0.093	0.926
OC3	0.130	0.139	0.936	0.349
Gender	0.395	0.046	8.601	0.000
GC2 x Gender	-0.504	0.075	-6.722	0.000
GC3 x Gender	-0.240	0.099	-2.422	0.015
OC1 x Gender	0.076	0.103	0.732	0.464
OC2 x Gender	-0.189	0.124	-1.518	0.129
OC3 x Gender	-0.100	0.132	-0.754	0.451
SAT	-0.433	0.016	-26.594	0.000
HSGPA	-2.361	0.096	-24.696	0.000
URM Comparison				
(Intercept)	-2.640	0.074	-35.722	0.000
GC2	-0.266	0.073	-3.635	0.000
GC3	-0.424	0.087	-4.903	0.000
OC1	0.280	0.096	2.900	0.004
OC2	-0.055	0.111	-0.494	0.621
OC3	0.163	0.116	1.400	0.161
URM	0.390	0.062	6.245	0.000
GC2 x URM	-0.164	0.105	-1.570	0.116
GC3 x URM	-0.001	0.138	-0.004	0.996
OC1 x URM	-0.421	0.161	-2.620	0.009
OC2 x URM	-0.434	0.200	-2.171	0.030
OC3 x URM	-0.721	0.231	-3.125	0.002
SAT	-0.432	0.016	-26.615	0.000
HSGPA	-2.216	0.092	-24.062	0.000
Socioeconomic Comparison				
(Intercept)	-2.631	0.072	-36.716	0.000
GC2	-0.217	0.075	-2.889	0.004
GC3	-0.411	0.089	-4.625	0.000
OC1	0.284	0.098	2.912	0.004
OC2	-0.043	0.112	-0.386	0.700
OC3	0.219	0.117	1.875	0.061
SES	0.252	0.052	4.806	0.000
GC2 x SES	-0.312	0.086	-3.622	0.000
GC3 x SES	-0.117	0.110	-1.071	0.284
OC1 x SES	-0.309	0.117	-2.632	0.008
OC2 x SES	-0.363	0.146	-2.483	0.013
OC3 x SES	-0.721	0.165	-4.378	0.000
SAT	-0.431	0.016	-26.609	0.000
HSGPA	-2.207	0.090	-24.554	0.000
Family Education Background Comparison				
(Intercept)	-2.773	0.076	-36.264	0.000
GC2	-0.170	0.079	-2.144	0.032
GC3	-0.283	0.094	-3.008	0.003
OC1	0.322	0.103	3.116	0.002
OC2	0.036	0.119	0.299	0.765
OC3	0.271	0.124	2.176	0.030

FGN	0.433	0.046	9.357	0.000
GC2 x FGN	-0.254	0.075	-3.387	0.001
GC3 x FGN	-0.313	0.098	-3.174	0.002
OC1 x FGN	-0.211	0.101	-2.094	0.036
OC2 x FGN	-0.331	0.125	-2.647	0.008
OC3 x FGN	-0.441	0.133	-3.305	0.001
SAT	-0.411	0.016	-25.699	0.000
HSGPA	-2.255	0.092	-24.569	0.000

Consequences of achievement gaps: "Next steps" after GenChem 1

Fig. S3 plots data on what students did after taking the initial course in general chemistry as a function of their grade in that course, without controlling for indices of academic preparation. A dashed line represents the underrepresented group identified on the right margin; a solid line represents the relevant comparison group (e.g. men in the top panel). "Drop" (in red) represents the probability that the student never reappeared in the dataset; "retake" (blue) indicates the probability that the student took the initial course in the series again; "persist" is the probability that the student took the second course in the series at some point during the study period. The vertical dashed line on the graph indicates the 1.7 grade threshold for moving on in the series; the vertical dotted line on the graph indicates the typical median grade of 2.6 in each section. The data in this figure are analogous to the analysis presented in Fig. 4, but the estimated probabilities in this figure are not controlled for indices of student academic preparation and ability.

Table S5 presents the coefficients from the models on the next steps taken by students after enrolling in GenChem 1. Part A reports the values from models that do not control for indices of student academic preparation and ability; part B reports the values from models that do control for indices of student academic preparation and ability.

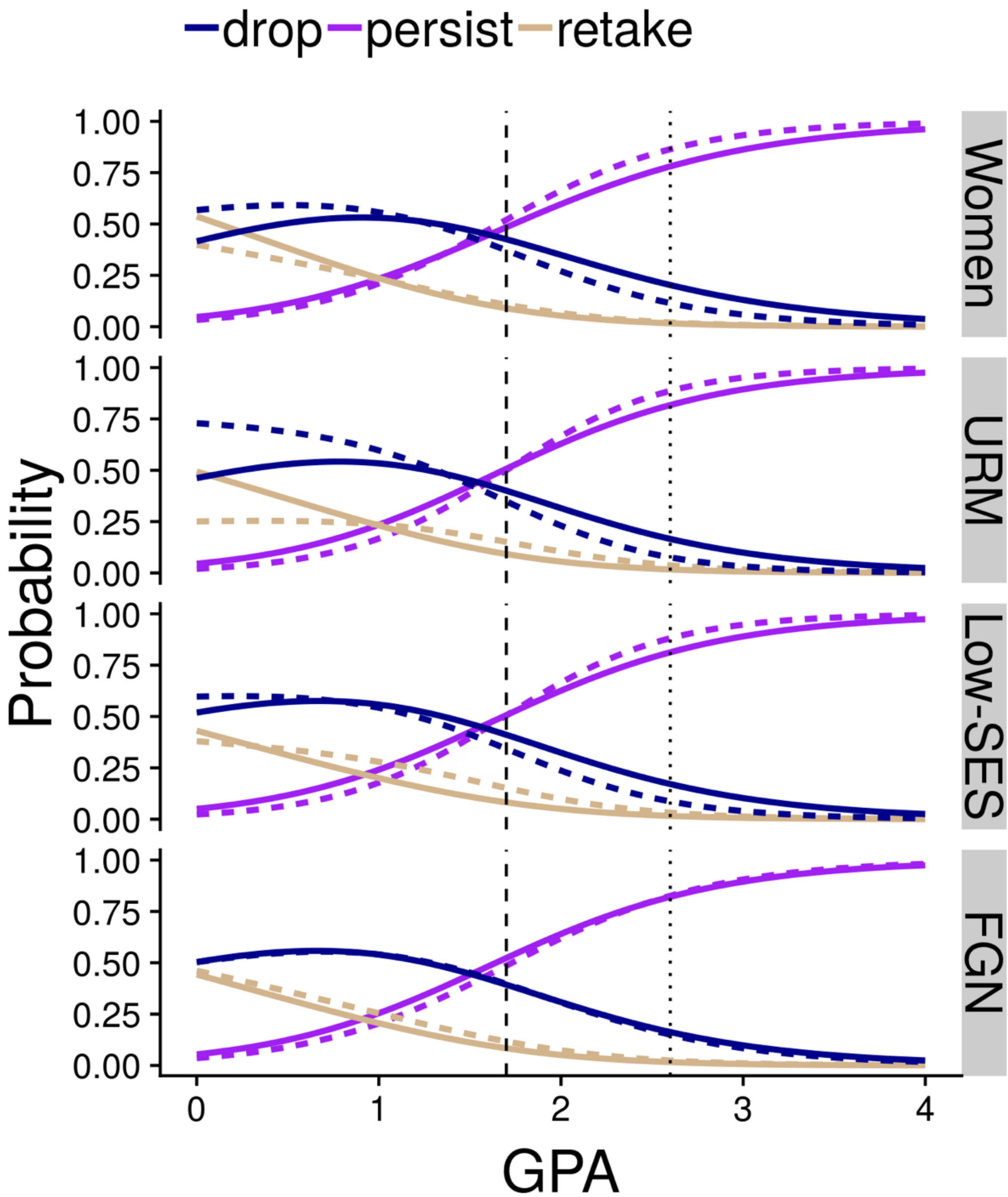

Fig. S3. **Consequences of GenChem 1 grades for four student subgroups, not controlled for indices of academic preparation.**

Table S5. Model coefficients for "next-steps" analyses.

A. Coefficients and standard errors for "Drop" and "Persist" outcomes relative to "Retake" without adjusting for student academic preparation (see Fig. 4).

Variable	**Drop**		**Persist**	
	Estimate	**S.E.**	**Estimate**	**S.E.**
Gender Comparison				
Intercept	0.77	0.023	-2.06	0.060
Gender	0.45	0.035	0.57	0.08
Grade	0.62	0.025	-0.48	0.043
Gender*Grade	0.23	0.036	0.25	0.058
URM Comparison				
Intercept	0.95	0.018	-1.90	0.043
URM	0.51	0.072	1.13	0.116
Grade	0.69	0.019	-0.41	0.032
URM*Grade	0.37	0.064	0.47	0.079
SES Comparison				
Intercept	0.92	0.018	-2.01	0.047
SES	0.48	0.052	1.1	0.092
Grade	0.68	0.02	-0.38	0.036
SES*Grade	0.30	0.049	0.29	0.064
FGN Comparison				
Intercept	0.99	0.021	-1.95	0.05
FGN	0.01	0.036	0.41	0.08
Grade	0.67	0.024	-0.38	0.044
FGN*Grade	0.09	0.037	0.08	0.059

* $p < .05$; ** $p < .01$; *** $p < .001$

B. Coefficients and standard errors for “Drop” and “Persist” outcomes relative to “Retake” with controls for student academic preparation and ability (see fig. S3).

Variable	Drop		Persist	
	Estimate	S.E.	Estimate	S.E.
Gender Comparison				
Intercept	0.79	0.024	-2.16	0.063
Gender	0.43	0.036	0.56	0.083
Grade	0.66	0.027	-0.29	0.046
Gender*Grade	0.24	0.036	0.32	0.06
SAT	0.00	0.0	0.00	0.0
HSGPA	-0.02	0.018	-0.26	0.03
URM Comparison				
Intercept	0.95	0.018	-1.96	0.045
URM	0.44	0.07	0.81	0.12
Grade	0.73	0.021	-0.22	0.036
URM*Grade	0.37	0.06	0.37	0.08
SAT	0.00	0.0	0.00	0.0
HSGPA	0.02	0.017	-0.21	0.03
SES Comparison				
Intercept	0.94	0.019	-2.01	0.048
SES	0.40	0.054	0.72	0.098
Grade	0.71	0.022	-0.23	0.039
SES*Grade	0.29	0.049	0.35	0.067
SAT	0.00	0.0	0.00	0.0
HSGPA	0.02	0.018	-0.21	0.03
FGN Comparison				
Intercept	1.03	0.022	-1.93	0.055
FGN	-0.08	0.037	0.13	0.084
Grade	0.72	0.026	-0.20	0.047
FGN*Grade	0.09	0.037	0.11	0.062
SAT	0.00	0.0	0.00	0.0
HSGPA	0.02	0.017	-0.22	0.030

Model selection for grade gap, hazard/attrition, and "next steps" analyses

Table S6 reports the full models, assessed models, and regression statistics used in model selection for analyzing A) achievement gaps, B) risk of not advancing, and C) what students did after the first time they took GenChem 1—their “next step” in terms of continuing in STEM majors that require the full general chemistry sequence, where “status” refers to whether the student re-took the course, never again appeared in the dataset (“dropped”), or went on to the next course in the series during the study period (“persisted”). In this table, “Step” refers to the sequence in stepwise selection. In the “Model” column, variables that follow the form “Women * course” specify a two-way interaction term; variables that follow the form (1|StudentNo) indicate a random effect, with all other terms being fixed effects. “AICc” is the value of the Akaike Information Criterion with the small-sample size correction; “delta” indicates the magnitude of the difference between the model in the row and the model with the smallest AICc. “Weight” is the model weighting.

To analyze the risk of not advancing for each student subgroup in each course in the GenChem and OChem series, and attrition over time, we conducted a two-phase model selection procedure. First we selected the optimal random-effect structure in the presence of all fixed effects based on AIC. Then, with the optimal random-effect structure, fixed effects were retained based on AIC. We repeated this analysis with a second model adjusted for academic preparation and ability. Hazard probability estimates ($\hat{h}_i(t_i)$) and standard errors for each group, j, and at each time point, i, were estimated by applying an inverse transformation to the logit-hazard model:

$$\hat{h}_j(t_i) = \frac{1}{1 + e^{-logit_{ij}}}$$

Survival probabilities, $\hat{S}_i(t_i)$, were then estimated as:

$$\hat{S}_i(t_i) = \hat{S}_i(t_{i-1})[1 - \hat{h}_i(t_i)]$$

Table S6. Model selection and regression statistics

A. Gap models.

Full model	Step	Model	AICc	delta	df	logLik	weight
*grade ~ Women + course + Women * course + (1 | StudentNo) + (1 | quarter) + (1 | section) + (1 | year)*	1	grade ~ Women + course + Women * course + (1 | StudentNo) + (1 | section)	172119.1	0	15	-86044.6	1
	1	grade ~ Women + course + Women * course + (1 | StudentNo)	173101.6	982.4	14	-86536.8	4.62E-214
	1	grade ~ Women + course + Women * course + (1 | section)	203087.3	30968.2	14	-101529.6	0
	2	grade ~ Women + course + Women * course + (1 | StudentNo) + (1 | section)	172040.9	0	15	-86005.5	1
	2	grade ~ Women + course + Women * course	203003.3	30962.0.	13	-101488.6	0
	3	grade ~ Women + course + Women * course + (1 | StudentNo) + (1 | section)	172040.9	0	15	-86005.5	1
	3	grade ~ Women + course + (1 | StudentNo) + (1 | section)	172270.7	229.7	10	-86125.3	1.29E-50
*grade ~ URM + course + URM * course + (1 | StudentNo) + (1 | year) + (1 | quarter) + (1 | section)*	1	grade ~ URM + course + URM * course + (1 | StudentNo) + (1 | section)	171463.6	0	15	-85716.8	1
	1	grade ~ URM + course + URM * course + (1 | StudentNo)	172493.7	1030.1	14	-86232.9	2.10E-224
	1	grade ~ URM + course + URM * course + (1 | section)	201984.6	30520.9	14	-100978.3	0
	2	grade ~ URM + course + URM * course + (1 | StudentNo) + (1 | quarter) + (1 | section)	165903.8	0	15	-82936.9	1
	2	grade ~ URM + course + URM * course	195914.9	30011.1	13	-97944.4	0
	3	grade ~ URM + course + URM * course + (1 | StudentNo) (1 | section)	165905.8	0	15	-82936.9	1
	3	grade ~ URM + course + (1 | StudentNo) + (1 | section)	165965.7	59.9	10	-82971.9	9.79E-14
grade ~ LowSES + course + LowSES * course + (1 | StudentNo) + (1 | year) + (1 | quarter) + (1 | section)	1	grade ~ LowSES + course + LowSES * course + (1 | StudentNo) + (1 | section)	171463.6	0	15	-85716.8	1
	1	grade ~ LowSES + course + LowSES * course + (1 | StudentNo)	172493.7	1030.1	14	-86232.9	2.10E-224
	1	grade ~ LowSES + course + LowSES * course + (1 | section)	201984.6	30520.9	14	-100978.3	0
	2	grade ~ URM + course + LowSES * course + (1 | StudentNo) + (1 | section)	171388.4	0	15	-85679.2	1
	2	grade ~ URM + course + LowSES * course	201903.1	30514.7	13	-100938.6	0

	3	grade ~ LowSES + course + LowSES * course + (1 | StudentNo) + (1 | section)	171388.4	0	15	-85679.2	1
grade ~ FGN + course + FGN * course + (1 | StudentNo) + (1 | year) + (1 | quarter) + (1 | section)	1	grade ~ FGN + course + FGN * course + (1 | StudentNo) + (1 | section)	168574.9	0	15	-84272.5	1
	1	grade ~ FGN + course + FGN * course + (1 | StudentNo)	169552.4	977.5	14	-84762.2	5.50E-213
	1	grade ~ FGN + course + FGN * course + (1 | section)	198253.7	29678.8	14	-99112.9	0
	2	grade ~ URM + course + FGN * course + (1 | StudentNo) + (1 | section)	168497.3	0	15	-84233.6	1
	2	grade ~ URM + course + FGN * course	198170.1	29672.8	13	-99072.0	0
	3	grade ~ FGN + course + FGN * course + (1 | StudentNo) + (1 | section)	168497.3	0	15	-84233.6	0.999999033
	3	grade ~ FGN + course + (1 | StudentNo) + (1 | section)	168525.0	27.7	10	-84252.5	9.67E-07
grade ~ Women + course + Women * course + SAT + HSGPA + (1 | StudentNo) + (1 | quarter) + (1 | section) + (1 | year)	1	grade ~ Women + course + Women * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164425.9	0	17	-82196.0	1
	1	grade ~ Women + course + Women * course + SAT + HSGPA + (1 | StudentNo)	165762.0	1336.1	16	-82865.0	7.40E-291
	1	grade ~ Women + course + Women * course + SAT + HSGPA + (1 | section)	188467.8	24041.9	16	-94218.0	0
	2	grade ~ Women + course + Women * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164321.1	0	17	-82143.5	1
	2	grade ~ Women + course + Women * course + SAT + HSGPA	188505.0	24183.9	15	-94237.45	0
	3	grade ~ Women + course + Women * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164321.1	0	17	-82143.5	1
	3	grade ~ Women + course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164547.4	226.3	12	-82261.7	7.08E-50
grade ~ URM + course + URM * course + SAT + HSGPA + (1 | StudentNo) + (1 | quarter) + (1 | section) + (1 | year)	1	grade ~ URM + course + URM * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	159035.2	0	17	-79500.6	1
	1	grade ~ URM + course + URM * course + SAT + HSGPA + (1 | StudentNo)	160356.4	1321.3	16	-80162.2	1.23E-287
	1	grade ~ URM + course + URM * course + SAT + HSGPA + (1 | section)	182542.5	23507.4	16	-91255.3	0
	2	grade ~ URM + course + URM * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	158937.3	0	17	-79451.6	1
	2	grade ~ URM + course + URM * course + SAT + HSGPA	182597.1	23659.8	15	-91283.5	0

	3	grade ~ URM + course + URM * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	158937.3	0	17	-79451.6	1
	3	grade ~ URM + course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	158997.7	60.4	12	-79486.8	7.63E-14
grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | StudentNo) + (1 | quarter) + (1 | section) + (1 | year)	1	grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164695.8	0	17	-82330.9	1
	1	grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | StudentNo)	166032.3	1336.5	16	-83000.1	6.04E-291
	1	grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | section)	189032.0	24336.2	16	-94500.01	0
	2	grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164593.9	0	17	-82279.9	1
	2	grade ~ LowSES + course + LowSES * course + SAT + HSGPA	189074.4	24480.5	15	-94522.2	0
	3	grade ~ LowSES + course + LowSES * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	164593.9	0	17	-82279.9	1
grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | StudentNo) + (1 | quarter) + (1 | section) + (1 | year)	1	grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	161782.8	0	17	-80874.4	1
	1	grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | StudentNo)	163080.4	1297.5	16	-81524.2	1.74E-282
	1	grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | section)	185358.1	23575.3	16	-92663.1	0
	2	grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	161678.6	0	17	-80822.3	1
	2	grade ~ FGN + course + FGN * course + SAT + HSGPA	185402.3	23723.7	15	-92686.2	0
	3	grade ~ FGN + course + FGN * course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	161678.6	0	17	-80822.3	0.999999802
	3	grade ~ FGN + course + SAT + HSGPA + (1 | StudentNo) + (1 | section)	161709.5	30.9	12	-80842.8	1.98E-07

B. Discrete-Time Logit-Hazard Analysis

Comparison	Step	Model	df	logLik	AIC	delta
RAW MODELS						
Binary Gender[a]	1	logit(h) ~ Course * Gender + (1|StudentID) + (1|SectionID)	14	-20315.5	40659.0	0.0
		logit(h) ~ Course * Gender + (1|StudentID) + (1| Year) + (1|SectionID)	15	-20315.5	40661.0	1.9
	2	logit(h) ~ Course * Gender + (1|StudentID) + (1|SectionID)	14	-20315.5	40659.0	0.0
		logit(h) ~ Course * Gender	12	-20581.3	41186.6	527.5
	3	**logit(h) ~ Course * Gender + (1|StudentID) + (1|SectionID)**	**14**	**-20315.5**	**40659.0**	**0.0**
		logit(h) ~ Course + Gender + (1|StudentID) + (1|SectionID)	9	-20355.5	40728.9	69.9
URM Status[b]	1	logit(h) ~ Course * URM + (1|StudentID) + (1|SectionID)	14	-19526.5	39081.1	0.0
		logit(h) ~ Course * URM + (1|StudentID) + (1| Year) + (1|SectionID)	15	-19526.0	39081.9	0.9
	2	logit(h) ~ Course * URM + (1|StudentID) + (1|SectionID)	14	-19526.5	39081.1	0.0
		logit(h) ~ Course * URM	12	-19779.5	39583.1	502.0
	3	**logit(h) ~ Course * URM + (1|StudentID) + (1|SectionID)**	**14**	**-19526.5**	**39081.1**	**0.0**
		logit(h) ~ Course + URM + (1|StudentID) + (1|SectionID)	9	-19549.6	39117.2	36.1
Socio-economic Status[c]	1	logit(h) ~ Course * SES + (1|StudentID) + (1|SectionID)	14	-20108.9	40245.9	0.0
		logit(h) ~ Course * SES + (1|StudentID) + (1| Year) + (1|SectionID)	15	-20108.8	40247.7	1.8
		logit(h) ~ Course * SES + (1|StudentID) + (1| Term) + (1|SectionID)	15	-20109.2	40248.3	2.4
	2	logit(h) ~ Course * SES + (1|StudentID) + (1|SectionID)	14	-19526.5	39081.1	0.0
		logit(h) ~ Course * SES	12	-19779.5	39583.1	502.0
	3	**logit(h) ~ Course * SES + (1|StudentID) + (1|SectionID)**	**14**	**-20108.9**	**40245.9**	**0.0**
		logit(h) ~ Course + SES + (1|StudentID) + (1|SectionID)	9	-20145.6	40309.2	63.3
Family Education Background[d]	1	logit(h) ~ Course * FGN + (1|StudentID) + (1|SectionID)	14	-19777.9	39583.8	0.0
		logit(h) ~ Course * FGN + (1|StudentID) + (1| Term) + (1|SectionID)	15	-19777.5	39585.0	1.2
	2	logit(h) ~ Course * FGN + (1|StudentID) + (1|SectionID)	14	-19777.9	39583.8	0.0
		logit(h) ~ Course * FGN	15	-19777.5	39585.0	1.2
	3	**logit(h) ~ Course * FGN + (1|StudentID) + (1|SectionID)**	**14**	**-19777.9**	**39583.8**	**0.0**
		logit(h) ~ Course + FGN + (1|StudentID) + (1|SectionID)	9	-19798.8	39615.7	31.9
ADJUSTED MODELS						
Binary Gender[e]	1	logit(h) ~ Course * Gender + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18960.1	37952.1	NA

	2	logit(h) ~ Course * Gender + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18960.1	37952.1	0.0
		logit(h) ~ Course * Gender + SAT + HSGPA	14	-19226.3	38480.5	569.4
	3	**logit(h) ~ Course * Gender + SAT + HSGPA + (1|StudentID) + (1|SectionID)**	**16**	**-18939.6**	**37911.2**	**0.0**
		logit(h) ~ Course + Gender + SAT + HSGPA + (1|StudentID) + (1|SectionID)	11	-18976.0	37974.1	62.9
URM Status[f]	1	logit(h) ~ Course * URM + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18347.4	36726.8	NA
	2	logit(h) ~ Course * URM + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18347.4	36726.8	0.0
		logit(h) ~ Course * URM + SAT + HSGPA	14	-18620.5	37269.1	542.3
	3	**logit(h) ~ Course * URM + SAT + HSGPA + (1|StudentID) + (1|SectionID)**	**16**	**-18347.4**	**36726.8**	**0.0**
		logit(h) ~ Course + URM + SAT + HSGPA + (1|StudentID) + (1|SectionID)	11	-18358.1	36738.2	11.4
Socio-economic Status[g]	1	logit(h) ~ Course * SES + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18983.0	37998.0	NA
	2	logit(h) ~ Course * SES + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18983.0	37998.0	0.0
		logit(h) ~ Course * SES + SAT + HSGPA	12	-20374.9	40773.7	2775.7
	3	**logit(h) ~ Course * SES + SAT + HSGPA + (1|StudentID) + (1|SectionID)**	**16**	**-18983.0**	**37998.0**	**0.0**
		logit(h) ~ Course + SES + SAT + HSGPA + (1|StudentID) + (1|SectionID)	11	-18999.8	38021.6	23.5
Family Education Background[h]	1	logit(h) ~ Course * FGN + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18627.3	37286.5	NA
	2	logit(h) ~ Course * FGN + SAT + HSGPA + (1|StudentID) + (1|SectionID)	16	-18627.3	37286.5	0.0
		logit(h) ~ Course * FGN + SAT + HSGPA	12	-20030.5	40085.0	2798.5
	3	**logit(h) ~ Course * FGN + SAT + HSGPA + (1|StudentID) + (1|SectionID)**	**16**	**-18627.3**	**37286.5**	**0.0**
		logit(h) ~ course + FGN + SAT + HSGPA + (1|StudentID) + (1|SectionID)	11	-18638.3	37298.6	12.1

[a]Full model: logit(h) ~ Course*Gender + (1|StudentID) + (1|Year) + (1|Term) + (1|SectionID)
[b]Full model: logit(h) ~ Course*URM + (1|StudentID) + (1|Year) + (1|Term) + (1|SectionID)
[c]Full model: logit(h) ~ Course*SES + (1|StudentID) + (1|Year) + (1|Term) + (1|SectionID)
[d]Full model: logit(h) ~ Course*FGN+ (1|StudentID) + (1|Year) + (1|Term) + (1|SectionID)
[e]Full model: logit(h) ~ Course*Gender + SAT + HSGPA + (1|StudentID) + (1|SectionID); only model to converge
[f]Full model: logit(h) ~ Course*URM + SAT + HSGPA + (1|StudentID) + (1|SectionID); only model to converge
[g]Full model: logit(h) ~ Course*SES + SAT + HSGPA + (1|StudentID) + (1|SectionID); only model to converge
[h]Full model: logit(h) ~ Course*FGN + SAT + HSGPA + (1|StudentID) + (1|SectionID); only model to converge

C. “Next steps after GenChem 1” plots.

Full model	Model	weight	df	delta	AICc	logLik
status ~ URM + grade + URM:grade + SAT + HSGPA	status ~ URM + grade + URM:grade + SAT + HSGPA	1.00	12	0.0	30649.0	-15312.5
	status ~ URM + grade + URM:grade + SAT	0.00	10	56.4	30705.5	-15342.7
status ~ Women + grade + Women:grade + SAT + HSGPA	status ~ Women + grade + Women:grade + SAT + HSGPA	1.00	12	0.0	30536.7	-15256.4
	status ~ Women + grade + Women:grade + SAT	0.00	10	63.3	30600.0	-15290.0
status ~ FGN + grade + FGN:grade + SAT + HSGPA	status ~ FGN + grade + FGN:grade + SAT + HSGPA	1.00	12	0.0	30702.8	-15339.4
	status ~ FGN + grade + FGN:grade + SAT	0.00	10	60.1	30762.9	-15371.5
	status ~ FGN + grade + SAT	0.00	8	66.0	30768.8	-15376.4
	status ~ grade + SAT	0.00	6	74.7	30777.5	-15382.8
status ~ LowSES + grade + LowSES:grade + SAT + HSGPA	status ~ LowSES + grade + LowSES:grade + SAT + HSGPA	1.00	12	0.0	30628.5	-15302.2
	status ~ LowSES + grade + LowSES:grade + SAT	0.00	10	53.2	30681.7	-15330.9
status ~ URM + grade + URM:grade	status ~ URM + grade + URM:grade	1.00	8	0.0	30918.6	-15451.3
status ~ Women + grade + Women:grade	status ~ Women + grade + Women:grade	1.00	8	0.0	30822.3	-15403.1
status ~ FGN + grade + FGN:grade	status ~ FGN + grade + FGN:grade	0.92	8	0.0	30992.1	-15488.0
	status ~ FGN + grade	0.08	6	4.9	30997.0	-15492.5
	status ~ grade	0.00	4	37.8	31029.9	-15511.0
status ~ LowSES + grade + LowSES:grade	status ~ LowSES + grade + LowSES:grade	1.00	8	0.0	30830.8	-15407.4

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