

Outcomes Related to Participation in Undergraduate Research: A Preliminary Study

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Undergraduate Education Today

- Emphasis on inquiry-based, discovery-driven learning that seeks to enhance critical, synthetic thinking and learning
- Boyer Commission, Carnegie Commission, NSF, et al encouraged HEd to infuse undergraduate education with inquiry-driven learning opportunities.
- Undergrad research ‘accelerates learning’ (Marklein, 2002)

Undergraduate Research (UR)

- Has become a prominent feature in many universities and some colleges
- NSF RAIRE and AIRE awards
- Concept has resonated on many campuses, and have subsequently directed funding and/or efforts toward UR

CURO at UGA

- Several initiatives came together to form the Center for Undergraduate Research Opportunities (CURO) at UGA
- CURO seeks to:
 - Encourage & recruit students to participate in research as undergraduates;
 - Enhance the experience of student & faculty engaged in research; and
 - Promote intellectual capstone experiences for students who complete an UR project.
- <http://www.uga.edu/honors/curo/>

The study at hand

- CURO officials contacted director in OIR, asked for collaborative assistance in examining the benefits of undergraduate research
- After discussions, it was decided to begin a preliminary study

Research Questions

- What are the characteristics of students who enroll in undergraduate research courses?
- How does the undergraduate research experience contribute to the students' academic achievement at UGA?
 - Differences in cumulative GPA by gender, race, by number of UR courses completed
 - Does enrollment in thesis make a difference?

The Data

- 5,665 undergraduate students who graduated at UGA during fiscal year 2005 (including Aug 2004, Dec 2004, May 2005) served as the sample for this study.
- Variables of interest:
 - Cumulative GPA at graduation
 - Number of UR courses completed
 - Enrollment in thesis course(s)
 - Demographic characteristics
 - Honors status
 - Total SAT score

Description of the sample

Of the 5,665 students :

- 11.1% (N=629) took one or more UR courses
- Fewer female (51% vs. 57%), but more non-white students (16% vs. 12%) completed one or more UR courses
- More honors students (35% vs. 10%) completed UR courses
- For those who completed UR courses:
 - 65% completed one course;
 - 25% completed two; and
 - 7% completed three.

Description of the sample

Of the students who completed UR courses:

- 27% completed thesis only;
- 55% took one or more UR courses other than thesis;
- 18% completed one or more other research courses followed by thesis;
- Significantly more Honor students completed one or more thesis courses (47% vs. 33%);
- Female students were more inclined to take other research courses without the thesis course (49.4% for male vs. 54.7% for female) or in companion with thesis (32.9% for male vs. 38.8% for female).

Results

I. Course Effects on cumulativeGPA

- For the graduating cohort, the average cumulative GPA of students who completed undergraduate research courses was significantly ($p < .000$) higher (3.38) than students who did not (3.19).
- However, the former group also had significantly ($p < .000$) higher average SAT scores (1243 vs. 1166).
- ANCOVA procedure was employed to compare GPA while controlling for SAT scores and gender.

Results

I. Course Effects on cumGPA

- Completing UR courses did contribute to higher cumulative GPA ($p < 0.000$). The effect of taking such courses on cumulative GPA was consistent for both males and females.

Taking URC		N	GPA_CUM		GPA_CUM controlled ^a	
			Mean	Increase	Mean	Increase
Female	No	2398	3.29	0.22	3.32	0.09
	Yes	283	3.51		3.41	
Male	No	1714	3.10	0.20	3.08	0.13
	Yes	258	3.30		3.21	

a Covariates were SAT scores and gender, and were evaluated at the values: SAT_COMBINE = 1174.7281.

Results

I. Course Effects on cumGPA

- Of the 629 students who completed one or more UR courses, (controlling for SAT score and gender), the greater the number of UR courses completed contributed to a higher cumulative GPA. This effect was consistent for males and females.

Number of URC		N	GPA_CUM	GPA_CUM controlled ^a
			Mean	Mean
Female	1	164	3.421	3.461
	2	83	3.552	3.513
	3 or more	36	3.741	3.658
Male	1	176	3.182	3.244
	2	59	3.416	3.406
	3 or more	23	3.538	3.497

a Covariates were SAT scores and gender, and were evaluated at the values: SAT_COMBINE = 1242.4399.

Results

I. Course Effects on cumGPA

- For the 536 honors students only (with SAT score controlled) taking one or more UR course had almost no effect on female honors students' cumulative GPA, while it did contribute to higher cumulative GPA for male honors students.

URC		N	GPA_CUM	GPA_CUM controlled ^a
			Mean	Mean
Female	No	184	3.783	3.790
	Yes	130	3.784	3.784
Male	No	117	3.709	3.707
	Yes	76	3.804	3.790

a Covariates were SAT scores and gender, and were evaluated at the values: SAT_COMBINE = 1326.4892.

Results

I. Course Effects on cumGPA

- For the 218 honors students who completed one or more UR courses, the greater the number of UR courses completed contributed to a higher cumulative GPA.

Number of URC		N	GPA_CUM	GPA_CUM controlled ^a
			Mean	Mean
Female	1	52	3.740	3.753
	2	49	3.806	3.805
	3	29	3.828	3.831
Male	1	38	3.759	3.750
	2	25	3.855	3.844
	3	13	3.838	3.826

a Covariates were SAT scores and gender, and were evaluated at the values:
SAT_COMBINE = 1346.0680.

Results

II. Effect of Thesis on cumulative GPA

- There was significant difference in cumGPA among students:
 - thesis only (3.21);
 - other UR courses only (3.38);
 - thesis and other UR courses (3.64).
- Average SAT score was not significantly different for the first two groups (1209 vs. 1230, $p=.298$), the third group however, had a much higher SAT (1318, $p=.000$). The pattern held for both men and women
- Again, ANCOVA procedure was employed to control for SAT and gender

Results:

II. Effect of Thesis on cumGPA

- Of the 629 students who took research courses, (controlling for SAT score and gender), completion of thesis in combination with UR courses made most contributed to students' cumulative GPA, as shown in the table below.

		N	GPA_CUM	GPA_CUM controlled ^a .
			Mean	Mean
Female	Thesis Only	57	3.348	3.429
	Other URC Only	159	3.468	3.490
	Thesis & Other URC	67	3.725	3.587
Male	Thesis Only	84	3.147	3.183
	Other URC Only	134	3.325	3.340
	Thesis & Other URC	40	3.534	3.436

a Covariates were SAT scores and gender, and were evaluated at the values: SAT_COMBINE = 1242.4399.

Results:

Overall comparison:

- In general, undergraduate students benefitted from completion of UR courses.
- Completing thesis with other UR courses appears to add even greater value.

	Non-Honors			Honors			Total
	Mean GPA_Cum	N	Percentage	Mean GPA_Cum	N	Percentage	
No Research Course	3.147	4718	92.0%	3.756	318	59.3%	5036
Thesis Only	3.127	148	2.9%	3.729	23	4.3%	171
Other URC Only	3.189	228	4.4%	3.766	115	21.5%	343
Thesis & Other URC	3.154	35	.7%	3.854 ^a	80	14.9%	115
Total		5129	100%		536	100%	5665

a. Significantly different from other groups at the .05 level.

Limitations

- One institution; one cohort
- Limited set of UR courses
- Need more longitudinal data
- What is the most appropriate measure of academic achievement
- Need to address qualitative aspects
- Other controlling variables in the model
- Continue education at graduate level



- Questions?

- Thank you!