

STUDENT-CENTERED ACTIVE LEARNING ENVIRONMENT
WITH UPSIDE-DOWN PEDAGOGIES:
STUDENT PERFORMANCE AND COURSE EVALUATIONS IN A
FLIPPED BIOLOGY CLASSROOM

KEVIN CURRY JR | KIMBERLY PIGFORD |
DR. MIRIAM FERZLI | DR. TRAVIS PARK
NORTH CAROLINA STATE UNIVERSITY



Introduction

- ▶ Despite a focus on investigating new ways to teach large undergraduate courses, lecture is still the predominate method.
- ▶ SCALE-UP facilitates hands-on, interactive, highly collaborative environments for large undergraduate courses.
- ▶ SCALE-UP flips the classroom focus into collaboration/working through material rather than learning it for the first time.

Methods

- ▶ Between-group comparison study
- ▶ Analyzed differences between SCALE-UP program students to those in a modified traditional lecture classroom (control)
 - ▶ Course evaluations
 - ▶ Performance on a final exam
 - ▶ Short answer
 - ▶ Multiple choice
 - ▶ Overall course grade
- ▶ Class size for the “control” is 240 students, and 96 for the SCALE-UP section

Methods

- ▶ Course Evaluation Analysis (response rate between 51%-62%)
 - ▶ Five sections of Biology 181 (n=501)
 - ▶ Four sections of Biology 183 (n=312)
 - ▶ All sections taught by the same professor between 2012-2014
- ▶ Performance Measure Analysis
 - ▶ Four sections of Biology 181 (n= 659)
 - ▶ Four sections of Biology 183 (n= 618)
 - ▶ All sections taught by the same instructor between 2013 and 2014
- ▶ One-way ANOVA's to determine any differences within section over time.
- ▶ T-tests to detect any differences between the SCALE-UP and traditional sections on all measures.
- ▶ The alpha level was set a priori at .05.

Course Evaluation Items

Course Evaluations BIO 181 & BIO 183

	Section	N	M	SD	t	p
1. Instructor stated course objectives	Control SCALE-UP	614 199	4.48 4.60	.71 .60	-2.08	.038*
2. Instructor receptive to students out-class	Control SCALE-UP	598 192	4.33 4.52	.82 .68	-2.82	.005*
3. Instructor explained material well	Control SCALE-UP	609 199	4.15 4.37	1.02 .78	-2.87	.004*
4. <i>Instructor was enthusiastic about teaching</i>	Control SCALE-UP	612 199	4.72 4.87	.58 .34	-3.45	.001*
5. Instructor was prepared for class	Control SCALE-UP	609 198	4.65 4.65	.60 .63	-.126	.90
6. Instructor gave useful feedback	Control SCALE-UP	608 199	4.20 4.40	1.00 .82	-2.53	.012*
7. Instructor treated students with respect	Control SCALE-UP	611 199	4.58 4.72	.62 .50	-2.85	.005*
8. <i>Overall, the instructor was an effective teacher</i>	Control SCALE-UP	607 199	4.27 4.51	.98 .72	-3.23	.001*

Course Evaluations...

Course Evaluations BIO 181 & BIO 183

	Section	N	M	SD	t	p
9. Course readings were valuable aids to learning	Control SCALE-UP	601 197	3.93 4.20	1.10 .93	-2.97	.003*
10. Course assignments were valuable aids to learning	Control SCALE-UP	607 199	4.16 4.25	.92 .88	-1.19	.235
11. Course improved my knowledge of the subject	Control SCALE-UP	612 199	4.40 4.57	.84 .69	-2.56	.011*
12. Overall this course was excellent	Control SCALE-UP	611 199	4.02 4.26	1.08 .86	.2.83	.005*
13. Lab sessions contributed to mastery of course concepts	Control SCALE-UP	606 197	3.78 3.99	.99 .96	-2.58	.010*
14. Lab facilities. equipment, supplies were adequate	Control SCALE-UP	606 197	4.30 4.33	.66 .67	-.51	.606
15. Degree of lab difficulty was appropriate	Control SCALE-UP	606 197	3.71 3.81	1.06 1.05	-1.22	.221
16. Overall, labs were effective learning experiences	Control SCALE-UP	609 196	3.79 3.99	.99 .94	-2.43	.015*
Overall Mean	Control SCALE-UP	614 199	4.19 4.37	.85 .70	-2.63	.009*

ANOVA- Student Evaluations Across Time

One Way ANOVA -BIO 181 Control- 2013-2014

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.914	2	.457	.664	.516
Within Groups	265.634	386	.688		
Total	266.548	388			

One Way ANOVA -BIO 183 Control- 2013-2014

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.075	1	.075	.097	.756
Within Groups	172.379	223	.773		
Total	172.454	224			

One Way ANOVA -BIO 181 Scale-UP- 2013-2014

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.043	1	.043	.084	.773
Within Groups	56.602	110	.515		
Total	56.645	111			

One Way ANOVA -BIO 183 Scale-UP- 2013-2014

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.055	1	.055	.119	.731
Within Groups	39.409	85	.464		
Total	39.464	86			

Course Grades BIO 181

Performance Measures BIO 181

	Section	N	M	SD	t	p
Exam Short Answer	Control	471	55.38	17.24	-.592	.554
	SCALE-UP	187	56.25	16.16		
Exam Multiple Choice	Control	471	52.89	11.80	-.738	.461
	SCALE-UP	187	53.61	10.02		
Final Grade	Control	472	80.80	12.93	-.598	.550
	SCALE-UP	187	81.44	11.31		

Course Grades BIO 183

Performance Measures BIO 183

	Section	N	M	SD	t	p
Exam Short Answer	Control	432	55.82	18.26	-1.274	.203
	SCALE-UP	184	57.71	12.96		
Exam Multiple Choice	Control	432	50.77	14.42	-.106	.915
	SCALE-UP	185	50.90	10.73		
Final Grade	Control	432	77.98	17.71	-1.034	.302
	SCALE-UP	186	79.44	11.44		

Student Comments- BIO 181 SCALE-UP

- “The course was well planned out. I enjoyed the Scale-Up because of the interactions and discussions. This was my favorite course for the semester.”

Fall 2012

- “I unknowingly signed up for the SCALE-UP section of Bio 181, and it was one of my best mistakes! I really like the group dynamic and feel that I got more out of the class than I would have from the normal lecture.”

Fall 2014

- “The flipped course that I was part of is an amazing thing! I loved getting to be so interactive with my peers and it really helped in learning the material”

Fall 2014

Student Comments- BIO 183 SCALE-UP

- ▶ I really liked the scale up course as opposed to the traditional lecture hall. It allows you to develop relationships with your peers, TA's, and the professor.”

Spring 2013

- ▶ “The classroom setting is a good way for students to easily access assistance from TA's or the instructor. Placing students in groups also helps them build the necessary social skills of cooperation and communication”

Spring 2013

- ▶ “I really enjoyed the scale-up version of this course. Personally, I learn a lot better with hands-on activities and out of class assignments.”

Spring 2014

Summary of Results

- ▶ No significant differences between SCALE-UP and traditional students on any of the performance measures.
- ▶ One-way ANOVA's confirmed no differences within section over time.
- ▶ T-tests indicated a significant difference on overall course evaluations scores between SCALE-UP (4.37) and traditional groups (4.19) ($t = -2.6$, $p = 0.009$), and several significant differences on ratings of the instructor in favor of the SCALE-UP section.

Implications/Recommendations

- ▶ The SCALE-UP program can be implemented with similar marks for student performance outcomes while being a more enjoyable experience for students.
- ▶ This study controlled for teaching bias by analyzing the data of one instructor. At least for this professor, students in a flipped SCALE-UP section rate the course (and professor) higher on end of course evaluations than those in a similar yet larger lecture section.
- ▶ Further research should examine this relationship with different professors and from SCALE-UP sections in different science content areas.

Thank You!

- ▶ What questions do you have?