Supplemental Material

CBE—Life Sciences Education

Odom *et al*.

Supplemental Materials

Title: Meta-analysis of gender performance gaps in undergraduate natural science courses

Authors: Sara Odom[1], Halle Boso[1], Scott Bowling[1], Sara Brownell[2], Sehoya Cotner[3], Catherine Creech[4], Abby Grace Drake[5], Sarah Eddy[6], Sheritta Fagbodun[7], Sadie Hebert[3], Avis C. James[8], Jan Just[9], Justin R. St. Juliana[5], Michele Shuster[8], Seth K. Thompson[3], Richard Whittington[7], Bill D. Wills[1], Alan E. Wilson[1], Kelly R. Zamudio[5], Min Zhong[1], & Cissy J. Ballen[1]

[1]Auburn University, Auburn, AL
[2]Arizona State University, Tempe, AZ
[3]University of Minnesota – Twin Cities, Minneapolis, MN
[4]Mt. Hood Community College, Gresham, OR
[5]Cornell University, Ithaca, NY
[6]Florida International University, Miami, FL
[7]Tuskegee University, Tuskegee, AL
[8]New Mexico State University, Las Cruces, NM
[9]Portland Community College, Portland, OR

Supplemental materials include:

Published studies included in meta-analysis.

Table S1. Full dataset.

Table S2. Descriptive categories of institutions and courses included in the meta-analysis.

Table S3. Qualitative descriptions of pedagogies.

Table S4. Analyses of subsets of data.

Figure S1. PRISMA flow diagram of data collection.

Figure S2. Full forest plot.

Published studies included in meta-analysis

Bardi, M., Koone, T., Mewaldt, S., & O'Connor, K. (2011). Behavioral and physiological correlates of stress related to examination performance in college chemistry students. *Stress*, *14*(5), 557–566. https://doi.org/10.3109/10253890.2011.571322

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Cotner, S., & Ballen, C. J. (2017). Can mixed assessment methods make biology classes more equitable? *PLOS ONE*, *12*(12), e0189610. https://doi.org/10.1371/journal.pone.0189610

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Peterfreund, A. R., Rath, K. A., Xenos, S. P., & Bayliss, F. (2008). The impact of supplemental instruction on students in stem courses: results from San Francisco State University. *Journal of College Student Retention: Research, Theory & Practice*, *9*(4), 487–503. https://doi.org/10.2190/CS.9.4.e

Rauschenberger, Matthew M.; Sweeder, Ryan D. (2010). Gender performance differences in biochemistry. *Biochemistry and Molecular Biology Education*, *38*(6), 380–384. https://doi.org/10.1002/bmb.20448

Rhodes, A. E. (2013). *The effect of teacher designed multimedia on student comprehension and retention rates within introductory college science courses*. https://krex.k-state.edu/dspace/handle/2097/15513

Rodriguez, M., Mundy, M.-A., Kupczynski, L., & Challoo, L. (2018). Effects of teaching strategies on student success, persistence, and perceptions of course evaluations. *Research in Higher Education Journal*, *35*. https://eric.ed.gov/?id=EJ1194444

Shibley, I. A., Milakofsky, L. M., Bender, D. S., & Patterson, H. O. (2003). College chemistry and piaget: an analysis of gender difference, cognitive abilities, and achievement measures seventeen years apart. *Journal of Chemical Education*, *80*(5), 569. https://doi.org/10.1021/ed080p569

Stanich, C. A., A. Pelch, M., J. Theobald, E., & Freeman, S. (2018). A new approach to supplementary instruction narrows achievement and affect gaps for underrepresented minorities, first-generation students, and women. *Chemistry Education Research and Practice*, *19*(3), 846–866. https://doi.org/10.1039/C8RP00044A

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Williams, A. E., Aguilar-Roca, N. M., & O'Dowd, D. K. (2016). Lecture capture podcasts: Differential student use and performance in a large introductory course. *Educational Technology Research and Development*, *64*(1), 1–12. https://doi.org/10.1007/s11423-015-9406-5

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Table S1. Full dataset.

study no.	yi	vi	assessment	Intro.or.nonintro	biol.or.chem	ped_cat	class_size	title	subject	institution
1	0.427	0.079	course	intro	biol	lecture	53	Research Coordination Network	intro to living systems	california state university, chico
2	0.777	0.239	course	intro	biol	lecture	35	Research Coordination Network	intro to living systems	california state university, chico
3	0.205	0.122	course	intro	biol	lecture	23	Research Coordination Network	intro to living systems	california state university, chico
4	0.148	0.027	course	intro	biol	lecture	155	Research Coordination Network	intro to living systems	california state university, chico
5	0.248	0.211	course	non-intro	biol	lecture	29	Research Coordination Network	biol of sex	california state university, chico
6	0.577	0.191	course	non-intro	biol	lecture	53	Research Coordination Network	biol of sex	california state university, chico
7	1.173	0.212	course	non-intro	biol	lecture	23	Research Coordination Network	biol of sex	california state university, chico
8	-0.811	0.311	course	intro	biol	NA	17	Research Coordination Network	intro to biol	capital community college
9	-0.779	0.352	course	intro	biol	NA	26	Research Coordination Network	intro to biol	capital community college
10	-0.055	0.054	course	intro	biol	active	243	Research Coordination Network	ecology	cornell university
11	-0.412	0.024	course	non-intro	biol	lecture	184	Research Coordination Network	Evolutionary biol and diversity	cornell university
12	0.084	0.117	course	intro	biol	NA	40	Research Coordination Network	gen biol I	finger lakes community college
13	-0.014	0.268	course	intro	biol	NA	17	Research Coordination Network	gen biol II	finger lakes community college
14	0.02	0.044	course	intro	biol	lecture	184	Research Coordination Network	Natural History of Life	new mexico state university

15	-0.215	0.045	course	intro	biol	lecture	190	Research Coordination Network	Natural History of Life	new mexico state university
16	0.79	0.039	course	intro	biol	lecture	185	Research Coordination Network	Natural History of Life	new mexico state university
17	0.586	0.105	course	intro	biol	lecture	96	Research Coordination Network	human biol	new mexico state university
18	0.932	0.101	course	intro	biol	lecture	93	Research Coordination Network	human biol	new mexico state university
19	-0.336	0.046	course	intro	biol	lecture	180	Research Coordination Network	Natural History of Life	new mexico state university
20	0.139	0.075	course	intro	biol	lecture	131	Research Coordination Network	Natural History of Life	new mexico state university
21	-0.305	0.055	course	intro	biol	lecture	136	Research Coordination Network	Natural History of Life	new mexico state university
22	0.051	0.081	course	non-intro	biol	lecture	102	Research Coordination Network	Cellular and Organismal biol	new mexico state university
23	-2.145	0.567	course	intro	biol	lecture	21	Research Coordination Network	biol	portland community college
24	0.37	0.262	course	intro	biol	active	20	Research Coordination Network	biol	portland community college
25	-0.838	0.629	course	intro	biol	active	14	Research Coordination Network	biol	portland community college
26	-0.711	0.466	course	intro	biol	active	12	Research Coordination Network	biol	portland community college
27	0.123	0.584	course	intro	biol	active	14	Research Coordination Network	biol	portland community college
28	-0.425	0.267	course	intro	biol	active	24	Research Coordination Network	Cell biol for Health OCC	portland community college
29	0.31	0.246	course	intro	biol	lecture	26	Research Coordination Network	Cell biol for Health OCC	portland community college

30	0.023	0.292	course	intro	biol	lecture	17	Research Coordination Network	Cell biol for Health OCC	portland community college
31	-0.196	0.351	course	intro	biol	lecture	15	Research Coordination Network	Intro Human Anatomy/Phys I	portland community college
32	-0.203	0.503	course	intro	biol	lecture	15	Research Coordination Network	Intro Human Anatomy/Phys I	portland community college
33	-0.315	0.246	course	intro	biol	active	22	Research Coordination Network	Habitats: Life of the Forest	portland community college
34	-0.41	0.282	course	intro	biol	active	23	Research Coordination Network	Principles of biol	portland community college
35	0.785	0.359	course	intro	biol	active	18	Research Coordination Network	Principles of biol	portland community college
36	-0.504	0.25	course	non-intro	biol	active	23	Research Coordination Network	Human Anatomy & Physiology I	portland community college
37	-0.806	0.565	course	non-intro	biol	active	24	Research Coordination Network	Human Anatomy & Physiology I	portland community college
38	-0.144	0.272	course	non-intro	biol	active	24	Research Coordination Network	Human Anatomy & Physiology I	portland community college
39	0.535	0.639	course	non-intro	biol	active	14	Research Coordination Network	Human Anatomy & Physiology II	portland community college
40	-0.539	0.457	course	non-intro	biol	active	17	Research Coordination Network	Human Anatomy & Physiology II	portland community college
41	0.755	0.36	course	non-intro	biol	active	19	Research Coordination Network	Human Anatomy & Physiology II	portland community college
42	0.66	0.296	course	non-intro	biol	lecture	25	Research Coordination Network	Microbiol	portland community college
43	-0.275	0.462	course	non-intro	biol	lecture	15	Research Coordination Network	Microbiol	portland community college
44	-0.401	0.159	course	intro	biol	lecture	50	Research Coordination	Organismic biol	tuskegee university

								Network		
45	0.036	0.015	course	intro	biol	active	273	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
46	-0.184	0.014	course	intro	biol	active	293	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
47	0.237	0.025	course	intro	biol	active	173	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
48	-0.014	0.023	course	intro	biol	active	179	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
49	0.475	0.037	course	intro	biol	active	118	Research Coordination Network	Evolution and biol of sex	university of minnesota
50	0.099	0.037	course	intro	biol	active	118	Research Coordination Network	Evolution and biol of sex	university of minnesota
51	0.416	0.022	course	intro	biol	active	190	Research Coordination Network	Evolution and biol of sex	university of minnesota
52	0.596	0.037	course	intro	biol	active	113	Research Coordination Network	Evolution and biol of sex	university of minnesota
53	0.108	0.035	course	intro	biol	active	117	Research Coordination Network	Evolution and biol of sex	university of minnesota

54	-0.067	0.023	course	intro	biol	active	187	Research Coordination Network	Evolution and biol of sex	university of minnesota
55	0.172	0.031	course	intro	biol	active	158	Research Coordination Network	gen biol	university of minnesota
56	0.036	0.023	course	intro	biol	active	181	Research Coordination Network	gen biol	university of minnesota
57	-0.118	0.016	course	intro	biol	active	260	Research Coordination Network	gen biol	university of minnesota
58	-0.159	0.037	course	intro	biol	active	113	Research Coordination Network	Human biol: Concepts and Current Ethical Issues	university of minnesota
59	0.327	0.037	course	intro	biol	active	111	Research Coordination Network	Human biol: Concepts and Current Ethical Issues	university of minnesota
60	-0.114	0.027	course	intro	biol	NA	160	Research Coordination Network	Environmental biol: Science and Solutions	university of minnesota
61	0.07	0.025	course	intro	biol	NA	165	Research Coordination Network	Environmental biol: Science and Solutions	university of minnesota
62	0.155	0.054	course	intro	chem	active	93	Research Coordination Network	gen Zoology	university of minnesota
63	-0.583	0.041	course	intro	chem	NA	103	Research Coordination Network	Chemical Principles I	university of minnesota
64	-0.77	0.061	course	intro	chem	NA	77	Research Coordination Network	Chemical Principles I	university of minnesota

65	-0.02	0.075	course	intro	chem	NA	58	Research Coordination Network	Chemical Principles I	university of minnesota
66	-0.164	0.258	course	intro	chem	NA	36	Research Coordination Network	intro to Chemical biol	university of minnesota
67	0.387	0.046	course	non-intro	biol	NA	97	Research Coordination Network	Evolution	university of minnesota
68	0.686	0.059	course	intro	biol	active	95	Research Coordination Network	intro biol	university of new hampshire
69	0.114	0.045	course	intro	biol	active	99	Cotner & Ballen, 2018	intro biol	university of minnesota
70	-0.065	0.032	course	intro	biol	active	129	Cotner & Ballen, 2018	intro biol	university of minnesota
71	-0.664	0.056	course	non-intro	biol	lecture	78	Cotner & Ballen, 2018	Evolution	university of minnesota
72	0.194	0.048	course	non-intro	biol	lecture	86	Cotner & Ballen, 2018	Evolution	university of minnesota
73	0.134	0.026	course	intro	biol	active	156	Cotner & Ballen, 2018	intro biol	university of minnesota
74	-0.087	0.026	course	intro	biol	active	154	Cotner & Ballen, 2018	intro biol	university of minnesota
75	0.29	0.036	course	intro	biol	active	158	Auburn U. dataset	intro biol	auburn university
76	0.274	0.065	course	intro	biol	active	79	Auburn U. dataset	intro biol	auburn university
77	0.032	0.025	course	intro	biol	active	216	Auburn U. dataset	intro biol	auburn university
78	0.265	0.033	course	intro	biol	active	196	Auburn U. dataset	intro biol	auburn university
79	-0.259	0.025	course	intro	biol	active	202	Auburn U. dataset	organismal biol	auburn university
80	0.004	0.027	course	intro	biol	lecture	203	Auburn U. dataset	organismal biol	auburn university
81	-0.236	0.038	course	intro	biol	active	149	Auburn U. dataset	organismal biol	auburn university
82	0.175	0.021	course	intro	biol	lecture	211	Auburn U. dataset	organismal biol	auburn university
83	-0.1	0.001	course	non-intro	chem	lecture	466	Rauschenberger & Sweeder, 2010	Biochem I	michigan state university
84	-0.056	0.001	course	non-intro	chem	lecture	466	Rauschenberger & Sweeder, 2010	Biochem II	michigan state university
85	0.226	0.055	course	intro	chem	lecture	NA	Shibley et al., 2013	intro chem	unknown 2
86	0.259	0.004	course	intro	biol	NA	NA	Peterfreund et al., 2008	Intro biol I	san francisco state university

87	-0.517	0.013	course	intro	biol	NA	NA	Peterfreund et al., 2008	Intro biol I	san francisco state university
88	0.155	0.007	course	intro	biol	NA	NA	Peterfreund et al., 2008	Intro biol II	san francisco state university
89	0.181	0.025	course	intro	biol	NA	NA	Peterfreund et al., 2008	Intro biol II	san francisco state university
90	0.414	0.008	course	non-intro	biol	NA	NA	Peterfreund et al., 2008	Genetics	san francisco state university
91	-0.155	0.024	course	non-intro	biol	NA	NA	Peterfreund et al., 2008	Genetics	san francisco state university
92	0.129	0.009	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem I	san francisco state university
93	0.509	0.098	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem I	san francisco state university
94	-0.388	0.003	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem I: Concepts	san francisco state university
95	-0.233	0.018	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem I: Concepts	san francisco state university
96	0.078	0.011	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem II	san francisco state university
97	-0.204	0.104	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem II	san francisco state university
98	0.207	0.01	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem II: Quant. Application	san francisco state university
99	0.077	0.06	course	intro	chem	NA	NA	Peterfreund et al., 2008	Gen Chem II: Quant. Application	san francisco state university
100	0	0.007	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Organic Chem I	san francisco state university
101	-0.774	0.023	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Organic Chem I	san francisco state university
102	-0.155	0.009	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Organic Chem II	san francisco state university
103	-0.026	0.042	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Organic Chem II	san francisco state

										university
104	0.078	0.015	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Biochem I	san francisco state university
105	-0.026	0.057	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Biochem I	san francisco state university
106	0.129	0.021	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Biochem II	san francisco state university
107	-0.179	0.073	course	non-intro	chem	NA	NA	Peterfreund et al., 2008	Biochem II	san francisco state university
108	-1.034	0.006	course	intro	chem	NA	NA	Boli et al., 1985	intro chem	stanford
109	0.206	0.033	course	intro	biol	active	155	Bolt, 2009	intro animal sciences	clemson university
110	-0.215	0.045	course	intro	biol	NA	190	Research Coordination Network	biol	new mexico state university
111	0.79	0.039	course	intro	biol	NA	185	Research Coordination Network	biol	new mexico state university
112	0.586	0.105	course	intro	biol	NA	96	Research Coordination Network	biol	new mexico state university
113	0.932	0.101	course	intro	biol	NA	93	Research Coordination Network	biol	new mexico state university
114	4.326	0.048	course	intro	biol	lecture	300	Cromley et al., 2013	intro biol	unknown 4
115	0.182	0.077	exams	intro	biol	lecture	53	Research Coordination Network	intro to living systems	california state university, chico
116	-0.494	0.231	exams	intro	biol	lecture	35	Research Coordination Network	intro to living systems	california state university, chico
117	0.198	0.122	exams	intro	biol	lecture	23	Research Coordination Network	intro to living systems	california state university, chico
118	-0.059	0.027	exams	intro	biol	lecture	155	Research Coordination Network	intro to living systems	california state university, chico
119	0.294	0.212	exams	non-intro	biol	lecture	29	Research Coordination Network	biol of sex	california state university, chico

120	0.133	0.188	exams	non-intro	biol	lecture	53	Research Coordination Network	biol of sex	california state university, chico
121	0.599	0.19	exams	non-intro	biol	lecture	23	Research Coordination Network	biol of sex	california state university, chico
122	-1.005	0.322	exams	intro	biol	NA	17	Research Coordination Network	intro to biol	capital community college
123	-0.76	0.351	exams	intro	biol	NA	26	Research Coordination Network	intro to biol	capital community college
124	0.031	0.054	exams	intro	biol	active	243	Research Coordination Network	ecology	cornell university
125	-0.061	0.023	exams	non-intro	biol	lecture	184	Research Coordination Network	Evolutionary biol and diversity	cornell university
126	0.023	0.117	exams	intro	biol	NA	40	Research Coordination Network	gen biol I	finger lakes community college
127	0.62	0.281	exams	intro	biol	NA	17	Research Coordination Network	gen biol II	finger lakes community college
128	-0.057	0.044	exams	intro	biol	lecture	184	Research Coordination Network	Natural History of Life	new mexico state university
129	-0.347	0.045	exams	intro	biol	lecture	190	Research Coordination Network	Natural History of Life	new mexico state university
130	0.496	0.038	exams	intro	biol	lecture	185	Research Coordination Network	Natural History of Life	new mexico state university
131	0.488	0.104	exams	intro	biol	lecture	96	Research Coordination Network	HUMAN biol	new mexico state university
132	0.729	0.098	exams	intro	biol	lecture	93	Research Coordination Network	HUMAN biol	new mexico state university
133	-0.373	0.046	exams	intro	biol	lecture	180	Research Coordination Network	Natural History of Life	new mexico state university
134	0.116	0.075	exams	intro	biol	lecture	131	Research Coordination Network	Natural History of Life	new mexico state university

135	-0.412	0.055	exams	intro	biol	lecture	136	Research Coordination Network	Natural History of Life	new mexico state university
136	0.029	0.081	exams	non-intro	biol	lecture	102	Research Coordination Network	Cellular and Organismal biol	new mexico state university
137	-2.612	0.659	exams	intro	biol	lecture	21	Research Coordination Network	biol	portland community college
138	0.169	0.258	exams	intro	biol	active	20	Research Coordination Network	biol	portland community college
139	-1.091	0.65	exams	intro	biol	active	14	Research Coordination Network	biol	portland community college
140	-0.615	0.46	exams	intro	biol	active	12	Research Coordination Network	biol	portland community college
141	0.14	0.585	exams	intro	biol	active	14	Research Coordination Network	biol	portland community college
142	-0.654	0.273	exams	intro	biol	active	24	Research Coordination Network	Cell biol for Health OCC	portland community college
143	-0.158	0.244	exams	intro	biol	lecture	26	Research Coordination Network	Cell biol for Health OCC	portland community college
144	0.041	0.292	exams	intro	biol	lecture	17	Research Coordination Network	Cell biol for Health OCC	portland community college
145	-0.351	0.354	exams	intro	biol	lecture	15	Research Coordination Network	Intro Human Anatomy/Phys I	portland community college
146	-0.161	0.502	exams	intro	biol	lecture	15	Research Coordination Network	Intro Human Anatomy/Phys I	portland community college
147	-0.312	0.246	exams	intro	biol	active	22	Research Coordination Network	Habitats: Life of the Forest	portland community college
148	-0.141	0.277	exams	intro	biol	active	23	Research Coordination Network	Principles of biol	portland community college
149	0.512	0.344	exams	intro	biol	active	18	Research Coordination Network	Principles of biol	portland community college

150	-0.552	0.252	exams	non-intro	biol	active	23	Research Coordination Network	Human Anatomy & Physiology I	portland community college
151	-0.876	0.567	exams	non-intro	biol	active	24	Research Coordination Network	Human Anatomy & Physiology I	portland community college
152	-0.003	0.271	exams	non-intro	biol	active	24	Research Coordination Network	Human Anatomy & Physiology I	portland community college
153	0.082	0.625	exams	non-intro	biol	active	14	Research Coordination Network	Human Anatomy & Physiology II	portland community college
154	-1.15	0.5	exams	non-intro	biol	active	17	Research Coordination Network	Human Anatomy & Physiology II	portland community college
155	0.775	0.361	exams	non-intro	biol	active	19	Research Coordination Network	Human Anatomy & Physiology II	portland community college
156	0.609	0.294	exams	non-intro	biol	lecture	25	Research Coordination Network	Microbiol	portland community college
157	0.212	0.158	exams	intro	biol	lecture	50	Research Coordination Network	Organismic biol	tuskegee university
158	-0.157	0.015	exams	intro	biol	active	273	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
159	-0.317	0.014	exams	intro	biol	active	293	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
160	0.225	0.025	exams	intro	biol	active	173	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota

161	-0.043	0.023	exams	intro	biol	active	179	Research Coordination Network	intro biol: Evolutionary and Ecological Persepectives	university of minnesota
162	0.279	0.037	exams	intro	biol	active	118	Research Coordination Network	Evolution and biol of sex	university of minnesota
163	-0.157	0.037	exams	intro	biol	active	118	Research Coordination Network	Evolution and biol of sex	university of minnesota
164	0.152	0.022	exams	intro	biol	active	190	Research Coordination Network	Evolution and biol of sex	university of minnesota
165	0.335	0.036	exams	intro	biol	active	113	Research Coordination Network	Evolution and biol of sex	university of minnesota
166	0.093	0.035	exams	intro	biol	active	117	Research Coordination Network	Evolution and biol of sex	university of minnesota
167	-0.211	0.023	exams	intro	biol	active	187	Research Coordination Network	Evolution and biol of sex	university of minnesota
168	0.031	0.031	exams	intro	biol	active	158	Research Coordination Network	gen biol	university of minnesota
169	-0.107	0.023	exams	intro	biol	active	181	Research Coordination Network	gen biol	university of minnesota
170	-0.306	0.016	exams	intro	biol	active	260	Research Coordination Network	gen biol	university of minnesota
171	-0.321	0.037	exams	intro	biol	active	113	Research Coordination Network	Human biol: Concepts and Current Ethical Issues	university of minnesota

172	0.086	0.036	exams	intro	biol	active	111	Research Coordination Network	Human biol: Concepts and Current Ethical Issues	university of minnesota
173	-0.262	0.027	exams	intro	biol	NA	160	Research Coordination Network	Environmental biol: Science and Solutions	university of minnesota
174	-0.158	0.025	exams	intro	biol	NA	165	Research Coordination Network	Environmental biol: Science and Solutions	university of minnesota
175	0.012	0.054	exams	intro	chem	active	93	Research Coordination Network	gen Zoology	university of minnesota
176	-0.575	0.041	exams	intro	chem	NA	103	Research Coordination Network	Chemical Principles I	university of minnesota
177	-0.774	0.061	exams	intro	chem	NA	77	Research Coordination Network	Chemical Principles I	university of minnesota
178	0.006	0.075	exams	intro	chem	NA	58	Research Coordination Network	Chemical Principles I	university of minnesota
179	-0.221	0.259	exams	intro	chem	NA	36	Research Coordination Network	intro to Chemical biol	university of minnesota
180	0.415	0.046	exams	non-intro	biol	NA	97	Research Coordination Network	Evolution	university of minnesota
181	0.637	0.058	exams	intro	biol	active	95	Research Coordination Network	intro biol	university of new hampshire
182	0.151	0.055	exams	intro	biol	active	82	Cotner & Ballen, 2018	intro biol	university of minnesota
183	-0.187	0.047	exams	intro	biol	active	89	Cotner & Ballen, 2018	intro biol	university of minnesota
184	-0.097	0.029	exams	intro	biol	active	148	Cotner & Ballen, 2018	intro biol	university of minnesota
185	0.111	0.057	exams	intro	biol	active	72	Cotner & Ballen, 2018	intro biol	university of minnesota

186	-0.198	0.055	exams	intro	biol	active	73	Cotner & Ballen, 2018	intro biol	university of minnesota
187	-0.433	0.026	exams	intro	biol	active	160	Cotner & Ballen, 2018	intro biol	university of minnesota
188	-0.082	0.047	exams	intro	biol	active	115	Cotner & Ballen, 2018	intro biol	university of minnesota
189	-0.087	0.03	exams	intro	biol	active	139	Cotner & Ballen, 2018	intro biol	university of minnesota
190	-0.453	0.022	exams	intro	biol	active	199	Cotner & Ballen, 2018	intro biol	university of minnesota
191	0.125	0.045	exams	intro	biol	active	99	Cotner & Ballen, 2018	intro biol	university of minnesota
192	-0.443	0.032	exams	intro	biol	active	129	Cotner & Ballen, 2018	intro biol	university of minnesota
193	-0.68	0.056	exams	non-intro	biol	lecture	78	Cotner & Ballen, 2018	Evolution	university of minnesota
194	-0.018	0.048	exams	non-intro	biol	lecture	86	Cotner & Ballen, 2018	Evolution	university of minnesota
195	-0.054	0.026	exams	intro	biol	active	156	Cotner & Ballen, 2018	intro biol	university of minnesota
196	-0.297	0.026	exams	intro	biol	active	154	Cotner & Ballen, 2018	intro biol	university of minnesota
197	-5.865	0.087	exams	non-intro	chem	lecture	82	Gross et al., 2015	physical chem for life science majors	university of massachusetts-amherst
198	-2.407	0.03	exams	non-intro	chem	active	49	Gross et al., 2015	physical chem for life science majors	university of massachusetts-amherst
199	-0.779	0.047	exams	non-intro	chem	NA	96	Bardi et al., 2011	Organic chem I	marshall university
200	-0.347	0.045	exams	intro	biol	NA	190	Research Coordination Network	biol	new mexico state university
201	0.496	0.038	exams	intro	biol	NA	185	Research Coordination Network	biol	new mexico state university
202	0.488	0.104	exams	intro	biol	NA	96	Research Coordination Network	biol	new mexico state university
203	0.729	0.098	exams	intro	biol	NA	93	Research Coordination Network	biol	new mexico state university
204	-4.526	0.17	exams	intro	biol	active	NA	Rhodes, 2013	Principles of biol	kansas state university
205	-5.67	0.175	exams	intro	biol	active	NA	Rhodes, 2013	Principles of biol	kansas state university
206	-4.26	0.29	exams	intro	biol	active	NA	Rhodes, 2013	Principles of biol	kansas state university
207	-4.34	0.121	exams	intro	biol	active	NA	Rhodes, 2013	Principles of biol	kansas state university

208	0.594	0.075	exams	intro	chem	NA	28	Niemeyer et al., 2009	gen chem	southwestern university
209	2.221	0.053	exams	intro	biol	active	221	Lax et al., 2017	intro gen biol	duquesne university
210	-3.114	0.058	exams	intro	biol	active	239	Lax et al., 2017	intro gen biol	duquesne university
211	-0.317	0.005	exams	intro	biol	active	400	Williams et al., 2016	intro biol	uc irvine
212	-0.145	0.002	exams	intro	chem	lecture	250	Stanich et al., 2018	Intro to chem	university of washington
213	0.084	0.009	exams	intro	biol		422	Eddy et al., 2014	Ecology and Evolution	university of washington
214	-0.138	0.009	exams	intro	biol		431	Eddy et al., 2014	Cell Bio and Genetics	university of washington
215	-0.263	0.015	exams	intro	biol		281	Eddy et al., 2014	Physiology and Development	university of washington
216	0.171	0.043	exams	intro	biol		159	Eddy et al., 2014	Ecology and Evolution	university of washington
217	-0.236	0.031	exams	intro	biol		143	Eddy et al., 2014	Cell Bio and Genetics	university of washington
218	-0.116	0.023	exams	intro	biol		176	Eddy et al., 2014	Physiology and Development	university of washington
219	-0.288	0.006	exams	intro	biol		678	Eddy et al., 2014	Ecology and Evolution	university of washington
220	-0.266	0.011	exams	intro	biol		375	Eddy et al., 2014	Cell Bio and Genetics	university of washington
221	-0.234	0.015	exams	intro	biol		278	Eddy et al., 2014	Physiology and Development	university of washington
222	-0.036	0.006	exams	intro	biol		630	Eddy et al., 2014	Ecology and Evolution	university of washington

223	-0.298	0.01	exams	intro	biol		424	Eddy et al., 2014	Cell Bio and Genetics	university of washington
224	-0.022	0.009	exams	intro	biol		456	Eddy et al., 2014	Ecology and Evolution	university of washington
225	-0.172	0.01	exams	intro	biol		379	Eddy et al., 2014	Cell Bio and Genetics	university of washington
226	-0.585	0.013	exams	intro	biol		321	Eddy et al., 2014	Physiology and Development	university of washington
227	-0.365	0.025	exams	intro	biol		164	Eddy et al., 2014	Ecology and Evolution	university of washington
228	-0.184	0.021	exams	intro	biol		188	Eddy et al., 2014	Cell Bio and Genetics	university of washington
229	-0.253	0.026	exams	intro	biol		167	Eddy et al., 2014	Physiology and Development	university of washington
230	-0.136	0.004	exams	intro	biol		970	Eddy et al., 2014	Ecology and Evolution	university of washington
231	-0.217	0.011	exams	intro	biol		372	Eddy et al., 2014	Cell Bio and Genetics	university of washington
232	-0.123	0.015	exams	intro	biol		287	Eddy et al., 2014	Physiology and Development	university of washington
233	-0.212	0.007	exams	intro	biol		614	Eddy et al., 2014	Ecology and Evolution	university of washington
234	-0.036	0.01	exams	intro	biol		438	Eddy et al., 2014	Cell Bio and Genetics	university of washington
235	-0.049	0.014	exams	intro	biol		282	Eddy et al., 2014	Physiology and Development	university of washington
236	-0.904	0.22	CI	intro	biol	lecture	23	Rodriguez et al., 2018	intro biol	unknown 1

237	-0.564	0.28	CI	intro	biol	active	21	Rodriguez et al., 2018	intro biol	unknown 1
238	-0.041	0.263	CI	intro	biol	active	23	Rodriguez et al., 2018	intro biol	unknown 1
239	0.757	0.337	CI	intro	chem	lecture	21	Rodriguez et al., 2018	gen chem	unknown 1
240	-0.158	0.203	CI	intro	chem	active	22	Rodriguez et al., 2018	gen chem	unknown 1
241	-0.374	0.33	CI	intro	chem	active	18	Rodriguez et al., 2018	gen chem	unknown 1
242	0.146	0.131	CI	intro	chem	NA	NA	Sunny et al., 2017	intro chem	unknown 3
243	-0.336	0.097	CI	intro	chem	NA	NA	Sunny et al., 2017	intro chem	unknown 3
244	-0.106	0.112	CI	intro	chem	NA	NA	Sunny et al., 2017	intro chem	unknown 3
245	0.144	0.091	CI	intro	chem	NA	NA	Sunny et al., 2017	intro chem	unknown 3
246	-0.242	0.019	CI	intro	biol	NA	NA	Willoughby & Metz, 2009	intro to cell biol and genetics	montana state university

Table S2. Descriptive categories of (A) Institutions and (B) Courses included in the meta-analysis. Categories are defined using the basic classification system within the Carnegie Classification of Institutions of Higher Education (carnegieclassifications.iu.edu). Institutions and courses are further broken down by whether they are designated as a Minority Serving Institution (MSI) by the United States Department of Education. These institutions of higher education enroll student populations with significant percentages of undergraduate minority students. Note that in some studies, multiple assessment measures (e.g., exam grade, total course grade) were collected from the same course.

(A) Institutions	MSI	non-MSI	Unknown	Total institutions
Associate's Colleges	2	2		4
Baccalaureate Colleges	0	1		1
Doctoral Universities	0	14		14
Master's Colleges & Universities	2	1		3
Unknown			4	4
Total	4	18	4	26

(B) Courses	MSI	non-MSI	Unknown	Total courses
Associate's Colleges	30	45		75
Baccalaureate Colleges	0	1		1
Doctoral Universities	0	120		120
Master's Colleges & Universities	16	22		38
Unknown			12	12
Total	46	188	12	246

Table S3. Qualitative descriptions of pedagogies. We characterized active learning classes as those that incorporated interactive and student-focused activities into the class structure. We considered lecture classes those in which the majority of class time was dedicated to lecture by the instructor, with few if any alternative activities occurring during a normal class period.

Author	Description
Active Learning	
Williams et al., 2016	Paper: "conducted in two sections of a large active-learning undergraduate introductory biology class". Qualtrics survey: "Active learning lectures with clickers, demonstrations and small group work. Roughly 15-25 minutes per 50 minutes was active."
Research Coordination Network	Two 90-minute classes per week, 60% active learning and 40% lecture on average. Course average determined by: exams-70%, assignments-10%, quizzes-20%. Exams were multiple choice, fill-in-blank, essay, and short answer.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 minute lab once a week. Traditional textbook (not OER). The lecture was front loaded with extensive active learning.
Research Coordination Network	110 min lec twice a week, 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly front loaded with extensive active learning.
Research Coordination Network	An Active-learning class, for 75 mins, two times per week, and a 2-hour lab each week.
Research Coordination Network	An Active-learning class, for 75 mins, two times per week, and a 2-hour lab each week.
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Research Coordination Network	An Active-learning class, for 75 mins, two times per week, and a 2-hour lab each week.
Research Coordination Network	An Active-learning class, for 75 mins, two times per week, and a 2-hour lab each week.
Research Coordination	A Monday mini-lecture with iClicker questions and writing prompts, Wednesday

Network	group activity with HOCS and iClicker questions, Friday student-led mini-review, formative assessment quiz.
Rodriguez et al., 2018	Project-based learning allows students to work on complex problems and provides authentic experiences in order for students to find purposeful meaning to STEM concepts. Capraro (2013) defines project-based learning as a teaching strategy that requires students to think critically and analytically, enhancing their higher-order thinking skills. Project-based learning involves students seeking a solution to complex problems situated within larger projects and justifying their results. Railsback (2002) also stated that project-based learning moves away from memorization and provides complex work that contains interdisciplinary disciplines and encourages cooperative learning. Project-based teaching strategies are a holistic method that is becoming more meaningful to students, especially those who have different learning styles, backgrounds, and abilities in which students are able to explore within the curriculum. [from intro--methods discuss that instructors underwent training related to the types of teaching, and sylabi were approved, but did not give any more specifics.
Rodriguez et al., 2018	Peer-led instruction involves breaking large lectures into smaller workshop sections in which peer instructors facilitate cooperative group work, thus increasing student interaction...Watkins and Mazur (2013) stated that by incorporating and structuring peer discussions, students have more opportunities to get to share ideas and form a collaborative discussion within the introductory science classroom. During these discussions, the instructor is able to listen to the students and students are able to engage more in the lecture, which increases the faculty-student interaction. PI creates a more exciting classroom and a positive environment is seen between faculty member and students. These constant interactions and feedback, as seen in PI courses, allows an instructor to see the weaknesses of the students which will allow him or her to better tailor their instruction according to the students' needs. [from intro--methods discuss that instructors underwent training related to the types of teaching, and syllabi were approved, but did not give any more specifics]
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Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Cotner & Ballen, 2018	lecture+interactive elements
Rhodes, 2013	Offered in a studio format. This format combines lecture and laboratory activities. Students work in groups of four and work through exercises as guided by a laboratory manual and a course website. Every course section is led by two full-time faculty instructors and two graduate teaching assistants; student to instructor ratio is 20:1. Over the course of a semester, seven main topics are covered: introduction to science, ecology, cell biology, genetics, energetics, plant biology, and animal biology. Students' grades are determined by performance on biweekly quizzes and seven unit exams.
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	science, ecology, cell biology, genetics, energetics, plant biology, and animal biology. Students' grades are determined by performance on biweekly quizzes and seven unit exams...[+multimedia module] development of the first multimedia module ensued using the principles outlined for multimedia development by Mayer (2001, 2009). Special attention was given to Mayer's (2001, 2009) principles for reducing extraneous processing and managing essential processing...[animation+narration available through course website (looks to be the eqivalent of AU's Canvas)...[module adjusted based on feedback from the prior semester]
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Gross et al., 2015	Example problems solved in class by the instructor in the standard course were adapted for peer–peer activities in the flipped-format course...The flipped-format course met either for one 75-min session per week or for two 50-min sessions per week. This reduced in-class time was supplemented with prerecorded "lectures" available to the students at least a week before class, which increased the online component in the flipped course compared with the standard course. These supplemental lectures were broken into 5- to 20-min chunks on specific topics in the OWLBook. Students were free to view the supplemental lectures or to skip them, as these lectures carried no course credit. The use of less in-class time allowed the instructor to offer more sections of the course, which allowed the class size to remain about constant despite a rapidly increasing total number of students taking the course. All other components of the standard course were present in the flipped course. Aside from the prerecorded lectures and reduced in-class time for the flipped-format course, a substantial difference between course formats was the increased use of active learning in the flipped classroom. This took the form of peer–peer think–pair–share activities, clicker responses, and example problems for students to work in the once-weekly 75-min sections. In the twice-weekly 50-min sessions, team-based learning (Michaelsen et al., 2004) was used. In this format, teams of five to eight students remained allied throughout the semester. In-class activities included difficult example problems attacked by teams, individual and team readiness assessments on new material, and student explanations of problem solutions on projected whiteboards.
Auburn U. dataset	Active

Auburn U. dataset	Active
Auburn U. dataset	Active
Auburn U. dataset	Active
Auburn U. dataset	Active
Auburn U. dataset	Active-learning. Students were assigned into groups for each of the four different exams. Each class period the students completed a worksheet based on the days lessons. The worksheets were collected at the end of each period. A third were graded, a third were given participation points, and a third I selected 1 paper from the groups to grade. The student groups were reshuffled for each exam section. The exams were a third short answer and remaining multiple choice. The final was 100% multiple choice
Lax et al., 2017	Students in the partial flip group watched a 16-min lecture that was recorded by the instructor demonstrating the Meselson and Stahl experiment. Following the recording, students answered the same two multiple-choice questions as the control group along with a 'password' question, the answer to which was embedded in the recorded lecture. The password question was used to ensure that students actually watched the recorded lecture prior to class...For the partial flip group, students worked on a group worksheet for 20 min. This worksheet challenged students to recreate the experiment and determine conclusions based on hypothetical situations and results. During the worksheet component of the lesson, four individuals (two course instructors plus two graduate-level teaching assistants) walked around the room to aid students. To facilitate discussion between staff and students, four rows in the auditorium-style classroom were left empty to act as aisles for the staff. At the end of the worksheet, the students were given three PRS questions. Students without remotes were asked to provide answers on 3 × 5 cards....Following class, for both groups, students completed an online assignment that covered the Meselson and Stahl experiment...The partial flip group completed the two 'novel' questions only...in the partial flip section, both the students and professor spent approximately 75% of class time in active learning/teaching (Figure 1) (see page 6 for copus pie)
Stanich et al., 2018	Active Learning
Research Coordination Network	Three 60-minute classes per week, approximately 60% lecture and 40% in-class case studies, activities, & discussions. Course average determined by: 56% exams, 21% quizzes, and 23% homework. Exams were about 2/3 multiple choice and 1/3 written-response/short answer.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 minute lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with limited active learning.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with limited active learning incorporated.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with limited active learning incorporated.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with limited active learning incorporated.

Research Coordination Network	A 110 minute lecture twice a week, and a 170 minute lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
Research Coordination Network	A 80 minute lecture twice a week and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
Research Coordination Network	A 110 minute lecture twice a week and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
Research Coordination Network	A 70 minute lecture twice a week and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
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Research Coordination Network	A 70 minute lecture twice a week and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
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Research Coordination Network	A 70 minute lecture twice a week and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional with active learning incorporated.
Auburn U. dataset	Active
Bolt, 2009	Ten to fifteen minutes of class time were classified as conforming exclusively to one of three types of material delivery. The three classifications were labeled as either traditional lecture,; technology-enhanced, or; web-enhanced...Although several teaching styles (and combinations of styles) are routinely employed, the focus of this study was to identify 10-15 periods of lecture time that had a clearly describable type of teaching, either traditional lecture (TL), technology-enhanced lecture (TE) and problem based, Web-enhanced learning, (WEB). Traditional lecture was defined as only the teacher coupled with a whiteboard, willing to interact with the students and respond to questions. Technology-enhanced was defined as the teacher coupled with projector, slides and various forms of multimedia, typically projected onto one of two large screens in the front of the lecture hall. In technology enhanced the instructor was willing to interact with students and respond to questions. Web-enhanced was defined as students presented with a problem and using Web resources to find solutions. The instructor was willing to interact with the class during the Web enhanced sessions but students were encouraged to search out solutions and answers on their own.

	It is important to note that during all types of instruction the teacher would respond to questions and interact with the class...[one class, so presumably alternated] Students were required to purchase I-clickers... Students were taught material throughout the course of the semester and after 10-15 minutes of instructional time knowledge questions were posed to the class to assess the relative level of understanding. Students responded with the ARS (IClickers) a system that allows for anonymous submission of answers, used for several purposes but most notably as a teaching tool to increase student engagement.
Lax et al., 2017	The control group received the same content from the recorded lecture in a live lecture format from the course instructor (lecture time 20 min). At the end of the lecture, the students were given two questions, answered using personal response system (PRS) remotes (Turning Point Technologies). Students without remotes were asked to provide answers on 3 × 5 cards. Students received participation credit for answering the questions...Following class, for both groups, students completed an online assignment that covered the Meselson and Stahl experiment. The control group completed identical questions to the partial flip group's in-class worksheet plus an additional two 'novel' questions... Using COPUS, we found that both the instructor and students in the control section spent only about 50% of class time involved in active learning/teaching activities (Student: Ind, AnQ, SQ, Prd, OG, CG, WG; Instructor: DV, AnQ, FUp, MG, 1o1, CQ, PQ). (see page 6 for COPUS pie).
Lecture-based	
Research Coordination Network	Two 70 minute lectures, One 50 minute discussion section.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 75-minute lectures per week.
Research Coordination Network	Two 75-minute lectures per week.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 50 minute lectures, One 75 minute peer lead workshop.
Research Coordination Network	Two 75-minute lectures per week.
Research Coordination Network	Three 60-minute classes per week, primarily lecture-based. Course average determined by: 75% exams, 20% quizzes/homework, and 5% participation. Exams were mostly multiple choice with some fill-in-blank, essay, and short answer questions.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 minute lab once a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional.

Research Coordination Network	A 70 minute lecture and lab twice a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 70 minute lecture and lab twice a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 70 minute lecture and lab twice a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 110 minute lecture twice a week, and a 170 min lab once a week. Traditional textbook (not OER). Lectures were mostly traditional.
Research Coordination Network	A 45 min lecture three times a week (Team Taught).
Rodriguez et al., 2018	Instructor was introduced to each of the teaching methods; lecture-based, project-based, and peer-led instruction. In this session, the instructors received a formal understanding of the three teaching strategies. On the second session, discussions of the understanding of each of the teaching strategies took place and a checklist was created (by the biology instructor, chemistry instructor, and investigator) which identified the characteristics of each of the teaching strategies. This checklist helped guide the design and activities of each of the sections that the instructors were expected to teach. On the third session, the checklist that was created from the second session was used to drive the design of the activities and assessments for each of the teaching strategies. In this session, the instructors applied the checklist to the activities that they intended to implement throughout the three teaching strategies. During the fourth session, the activities that were discussed throughout the third session were applied to the syllabus of the instructors' course. Each instructor was expected to submit three different syllabi that complemented the three teaching strategies. A final draft of the syllabus needed to be discussed and approved by the biology instructor, chemistry instructor, and investigator one week before classes resumed. In this way, before the fall 2015 semester began, the instructors for BIOL 1306 and CHEM 1311 understood the concepts of the three teachings strategies and also understood to only implement the teaching strategy that was assigned for the class. [no further details given as to what was on the syllabi]
Rodriguez et al., 2018	Instructor was introduced to each of the teaching methods; lecture-based, project-based, and peer-led instruction. In this session, the instructors received a formal understanding of the three teaching strategies. On the second session, discussions of the understanding of each of the teaching strategies took place and a checklist was created (by the biology instructor, chemistry instructor, and investigator) which identified the characteristics of each of the teaching strategies. This checklist helped guide the design and activities of each of the sections that the instructors were expected to teach. On the third session, the checklist that was

	created from the second session was used to drive the design of the activities and assessments for each of the teaching strategies. In this session, the instructors applied the checklist to the activities that they intended to implement throughout the three teaching strategies. During the fourth session, the activities that were discussed throughout the third session were applied to the syllabus of the instructors' course. Each instructor was expected to submit three different syllabi that complemented the three teaching strategies. A final draft of the syllabus needed to be discussed and approved by the biology instructor, chemistry instructor, and investigator one week before classes resumed. In this way, before the fall 2015 semester began, the instructors for BIOL 1306 and CHEM 1311 understood the concepts of the three teachings strategies and also understood to only implement the teaching strategy that was assigned for the class. [no further details given as to what was on the syllabi]
Cotner & Ballen, 2018	lecture
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Auburn U. dataset	Traditional lecture with 1 or 2 think pair share activities (1/3 graded, 2/3 participation credit). Students had access to "Supplementary Instructor" (SI) an undergrad that has taken the course. The SI provided an extra hour of instruction. There were 4 exams 75% multiple choice and given the choice of 1 of 3 short answer questions per exam. Final was 100% multiple choice. There were no SI instructors available. I did use undergraduate lecture assistants (n = 6) in class to aid small group discussions and answer student questions.
Auburn U. dataset	Traditional
Rauschenberger, Matthew M.; Sweeder, Ryan D.	The instructional model for these courses consists of a single large lecture section (e.g. n ¼ 466 students in fall 2008 for Biochem I), with prerequisites...The course does not contain many of the previously mentioned curricular changes so can provide a good reference for ''traditional'' instruction. [intro made mention of active learning approaches]... In recent years, some sections of these courses used in-class response pads, or clickers, in the hope of enhancing class participation and learning
Rauschenberger & Sweeder, 2010	The instructional model for these courses consists of a single large lecture section (e.g. n ¼ 466 students in fall 2008 for Biochem I), with prerequisites...The course does not contain many of the previously mentioned curricular changes so can provide a good reference for ''traditional'' instruction. [intro made mention of active learning approaches]... In recent years, some sections of these courses used in-class response pads, or clickers, in the hope of enhancing class participation and learning
Shibley et al., 2013	The course consisted of a two-period lecture and two-period lab each week for a fifteen-week semester.
Research Coordination Network	Hybrid course: One 1-hour lecture, one 2-hour lab, online work
Research Coordination Network	Hybrid course: One 1-hour lecture, one 2-hour lab, online work
Research Coordination Network	Hybrid course: One 1-hour lecture, one 2-hour lab, online work
Research Coordination Network	Hybrid course: One 1-hour lecture, one 2-hour lab, online work

Research Coordination Network	Two 75-min lectures per week
Research Coordination Network	Two 75-min lectures per week
Research Coordination Network	Two 75-min lectures per week

Table S4. Across all analyses, we found null results of the overall difference in performance based on gender. (A) full fixed effects model with university and subject as nested random effects and imputed average standard deviation (SD) in place of missing values; (B) full model with high estimated SD in place of missing values; (C) subset analysis excluding studies with missing SD values; (D) subset analysis of only unpublished data; (E) subset analysis of only published data. A notable difference between groups is the Hedges' g values among the (D) unpublished and (E) published data. While both are nonsignificant, the difference between them is fairly large, ranging from 0.36 to 0.41 difference. We hypothesize this difference is due to the fact that unpublished data were collected from institutions associated with the Equity and Diversity in Undergraduate STEM Research Coordination Network, a network funded by the National Science Foundation with an explicit focus on promoting equitable outcomes in STEM courses. Thus, it may come as little surprise that courses from these collective institutions had a smaller effect size.

(A) Full dataset	**Hedges' *g***	**p-value**	**Lower 95% CI**	**Upper 95% CI**
Course prioritized	-0.2268	0.4119	-0.7685	0.3149
Exams prioritized	-0.2197	0.4263	-0.7610	0.3216
(B) High estimated SD				
Course prioritized	-0.2238	0.4173	-0.7646	0.3170
Exams prioritized	-0.2168	0.4317	-0.7573	0.3236
(C) No imputed SD				
Course prioritized	-0.2222	0.4731	-0.8294	0.3849
Exams prioritized	-0.2157	0.4861	-0.8227	0.3912
(D) Unpublished data				
Course prioritized	0.0614	0.4854	-0.1111	0.2399
Exams prioritized	0.0138	0.8295	-0.1116	0.1392
(E) Published data				
Course prioritized	-0.3436	0.4014	-0.1.1464	0.4591
Exams prioritized	-0.3486	0.3946	-1.1511	0.4539

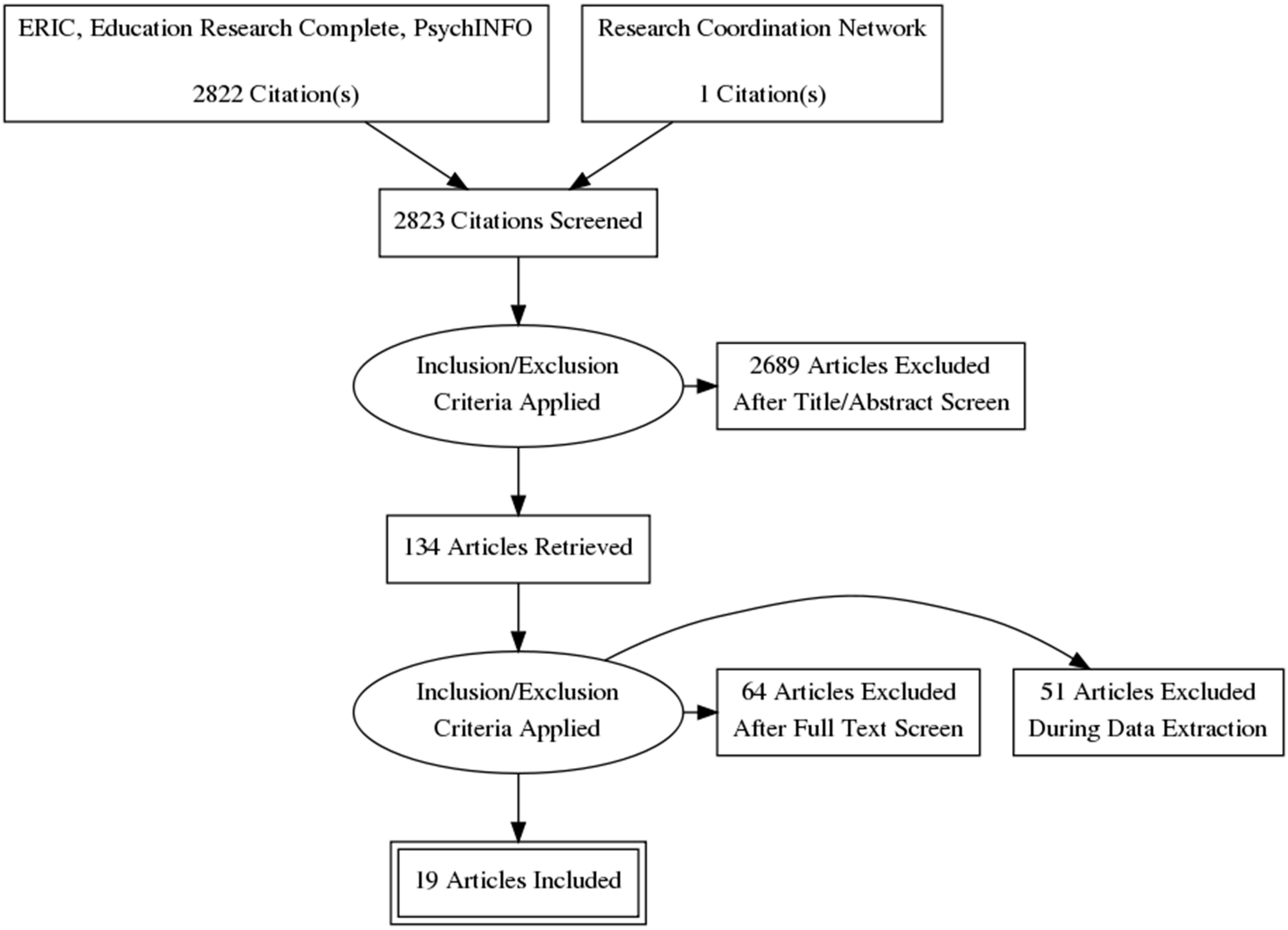

Figure S1. PRISMA flow diagram of data collection. Figure generated using the PRISMA flow diagram generator from prisma.thetacollaborative.ca.

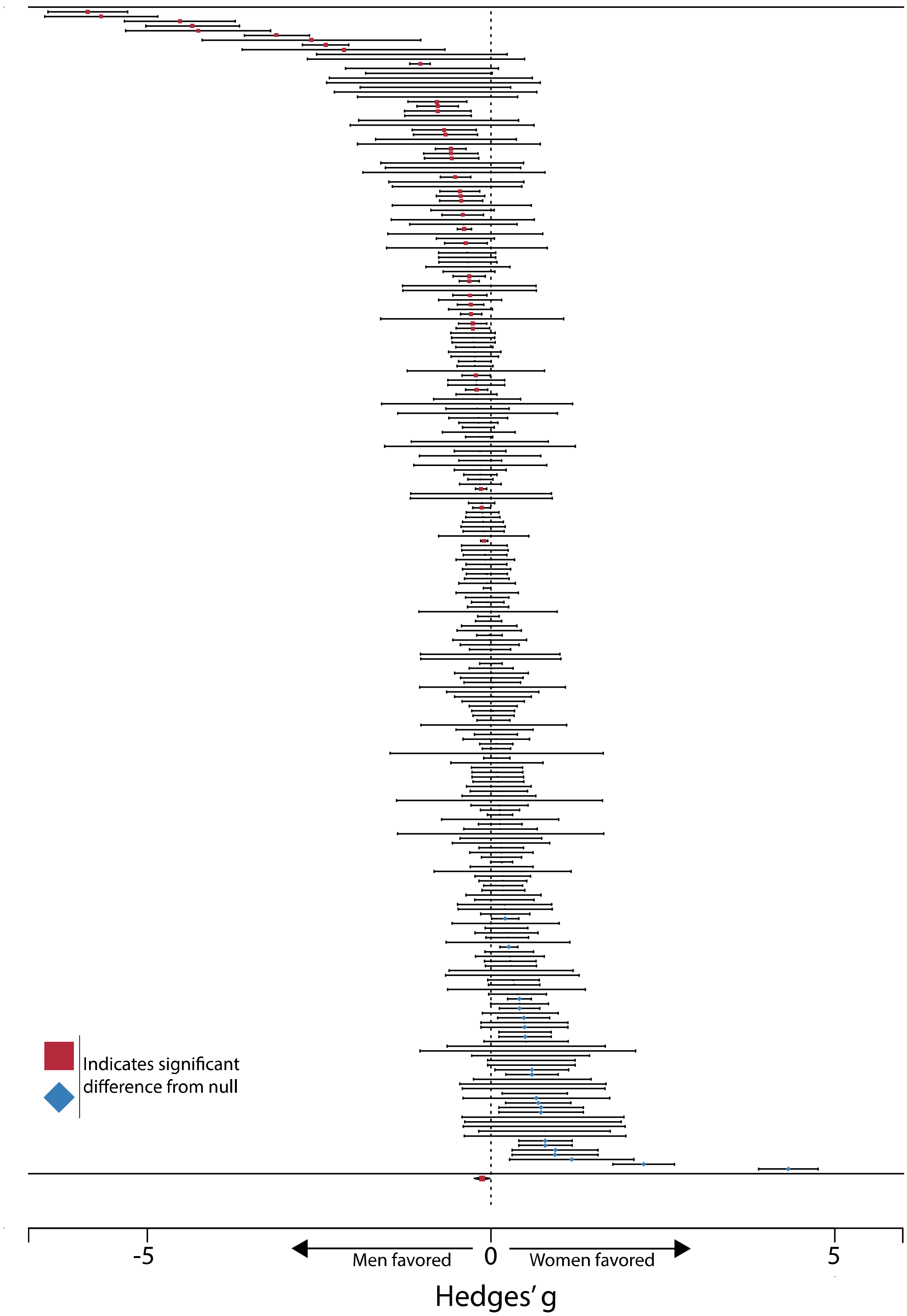

Figure S2. Full forest plot. Red squares indicate classes with significant gender gaps favoring men; blue diamonds indicate classes with significant gender gaps favoring women. Overall, we observed a non-significant gender gap in performance outcomes.