

Supplemental Material

CBE—Life Sciences Education

Alvares *et al.*

SUPPLEMENTAL MATERIALS

Assessing Community college biology student perceptions of being called on in class

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Appendix A: Methods

Canvas (LMS) Survey: Calling on Biology Students Post-Course Survey

This is a survey to understand perspectives, views, and the effects of being called on in biology courses. Student Consent for "Calling on Biology Students, COBS" project: All students enrolled in this course are invited to take an online survey to understand how being called on in class affects student learning. This will be done at the end of the term.

CONFIDENTIALITY:

You will be asked your name and age in this survey. Neither of these will be attached to your survey responses for analysis. Individual responses will be used for research purposes only and will be strictly confidential. Any information from the study that is published will be aggregated class data (no individual data).

The survey results will be sent to Gwen Shlichta, and/or Stacy Alvares, Ph.D., and/or Jenny McFarland, Ph.D. at Edmonds Community College, (Lynnwood, WA). Your name will not be connected with the survey responses that you enter even if an instructor is offering extra credit points for doing the surveys. Upon completion of the survey, your instructor will be sent a spreadsheet with the names of the students from their course(s) who completed the survey, so that the instructor can assign the participation or extra credit points. Individual responses will be used for research purposes only and will be strictly confidential. The individual student survey responses will not be viewed by the instructor(s) in your course. The instructor(s) will only view the aggregated data for this class. This survey should take no more than 5 minutes to complete.

INFORMED CONSENT TO PARTICIPATE:

You have the right to request that your data not be used for biology education research. If you choose to have your data removed from this research study please email Gwen Shlichta (gwen.bugheart@email.edcc.edu) and request an opt out form. Because understanding classroom climate is important to EdCC Biology department faculty, you must complete the survey to receive the points. Opting out of having your data used for research (in addition to departmental feedback) will not affect your grade in the class in any way. Course faculty will not know whether or not you asked for your data to be opted out of this study. Even though your data will not be included in the research study, you need to complete the survey as part of normal class activities for the biology department.

Your submission of responses to survey questions indicates your consent to participate. If you have any additional questions, please contact Gwen Shlichta at gwen.bugheart@email.edcc.edu.

The last question on the survey will ask for your name, which will be emailed to your instructor if there is credit assigned to this activity (no other information will be sent to your instructor about your individual answers to these questions). We also need to know if you are under 18 years old; we cannot include data of students under 18 in research studies without parental consent.

Are you under 18?

- Yes
- No

Classroom Experience

In which class are you currently enrolled?

Mark only one.

- BIOL 100
- BIOL 211
- BIOL212
- BIOL 213
- BIOL 241
- BIOL 242
- BIOL 260
- BIOL 175

Who is your instructor?

Mark only one.

- Instructor Name A
- Instructor Name B
- Instructor Name C
- Instructor Name D
- Instructor Name E
- Instructor Name F
- Instructor Name G
- Instructor Name H

1. In what ways did being called on in class support your learning?

2. In what ways did being called on in class interfere with your learning?

3. In a typical week approximately what percentage of students answered questions in your class over this quarter?

Check all that apply.

- 0-25%
- 26-50%
- 51-75%
- 76-100%

4a. In your previous college courses which of the following have you experienced (check all that apply)?

Check all that apply.

- **Volunteer call**- instructors pose questions and students raise their hands to volunteer to be called on to answer the questions.
- **Random call**- Instructors pose questions and call on individual students from a deck of student cards and/or randomized list after students had a chance to think and discuss the question with their peers.
- **Cold call**- instructors pose questions and call on individual students to answer without time to discuss with others.
- **Warm Call** (aka Think-Pair-Share): Students are called on after students had a chance to think and discuss the question with their peers. This is sometimes called “cold call”
- **Group call** – Instructors post questions to a group and a designated or assigned person answers the question for the group.
- **Group Volunteer call** - Instructors pose a question to the whole class and students can call out answers.

4b. In this current course which of the following have you experienced (check all that apply)?

Check all that apply.

- **Volunteer call**- instructors pose questions and students raise their hands to volunteer to be called on to answer the questions.
- **Random call**- Instructors pose questions and call on individual students from a deck of student cards and/or randomized list after students had a chance to think and discuss the question with their peers.
- **Cold call**- instructors pose questions and call on individual students to answer without time to discuss with others.
- **Warm Call** (aka Think-Pair-Share): Students are called on after students had a chance to think and discuss the question with their peers. This is sometimes called “cold call”
- **Group call** – Instructors post questions to a group and a designated or assigned person answers the question for the group.
- **Group Volunteer call** - Instructors pose a question to the whole class and students can call out answers.

5a. In the past, how often did you usually respond to questions in a class over the quarter?

Mark only one.

- none
- 2 times this quarter
- 3-4 times this quarter
- 5-6 times this quarter
- 7-8 times this quarter
- 9-10 times this quarter
- over 10 times this quarter

5b. How often did you respond to questions in your current class this quarter?

Mark only one.

- none
- 2 times this quarter
- 3-4 times this quarter
- 5-6 times this quarter
- 7-8 times this quarter
- 9-10 times this quarter
- over 10 times this quarter

6. Random call is when instructors pose questions and call on individual students from a deck of student cards and/or randomized list after students had a chance to think and discuss the question with their peers. Was random call used in a previous class or another class you are taking now?

Mark only one.

- Yes
- No

7. If you answered yes to the previous question, how many different classes have your instructors used random call? (include the one you are currently in if it is used).

Mark only one.

- 2 classes (this class and one other class)
- 3 classes (this class and 2 other classes)
- 4 classes (this class and 3 other classes)
- 5 or more classes

8. I feel like I am part of a community of students in this Biology class EdCC.

Mark only one.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

9. I felt comfortable asking questions in this class.

Mark only one.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

10. I participate in discussion with other students in this class.

Mark only one.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

11. I was motivated to try hard on course assignments and exams in this class.

Mark only one.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

12. If I anticipate being called on in class, I am likely to ...

Mark only one.

- skip class to avoid speaking in class
- come to class with high anxiety that interferes with my learning
- be nervous in class until after I am called on
- be engaged in class and somewhat anxious about being called on
- participate in the class without worrying about being called on

13. Please share any comments, concerns, observations and / or suggestions regarding calling on students in biology courses at EdCC. Identifying information (name and age) will be removed from these comments and all of the data, before faculty read them after the grades are submitted for your course. We are interested in your experiences and perspectives.

Student Background [Demographic information]

What is your gender?

Mark only one

- Female
- Male
- Trans
- Gender Non-conforming/Other
- Prefer not to respond

I identify my race or ethnicity as

Mark only one

- Asian/Asian American
- African American/Black
- Caucasian/White
- Hispanic/Latino/Latinx
- Native American/American Indian/Alaska Native
- Pacific Islander
- Native Hawaiian
- I prefer not to answer

Is English your first language?

Mark only one

- Yes
- No

Was English the primary language of instruction in your high school?

Mark only one

- Yes
- No

Are you a first generation college student?

Mark only one

- Yes
- No

Are you working while going to school?

Mark only one

- No
- Yes, under 10 hours per week
- Yes, 10-19 hours per week
- Yes, 20-29 hours per week
- Yes, 30-39 hours per week
- Yes, 40 or more hours per week

Table S1. Total sample disaggregated by dataset, call type, and student demographics. Chi-squared analyses indicate that in general students were evenly distributed by demographics to warm random call classes and classes that did not use random call. The exception to this is that classes that used warm random call were slightly enriched with men and significantly enriched with students who reported not learning English as their first language.

Complete Dataset <i>n</i>=520			
	Warm Random Call	Not Random Call	Chi-Squared
	286	234	$X^2=5.2$, $df=1$, $p=0.023$
Subsampled Dataset <i>n</i>=163			
	Warm Random Call	Not Random Call	Chi-Squared
Total	87	77	$X^2=0.61$, $df=1$, $p=0.435$
Women	61	64	$X^2=0.07$, $df=1$, $p=0.788$
Men	25	13	$X^2=3.79$, $df=1$, $p=0.052$
White/Asian	58	51	$X^2=0.45$, $df=1$, $p=0.503$
PEER	25	22	$X^2=0.19$, $df=1$, $p=0.662$
EngNotFirst	54	33	$X^2=5.07$, $df=1$, $p=0.024$
EngFirst	33	43	$X^2=1.32$, $df=1$, $p=0.251$
Continuing Generation	48	43	$X^2=0.27$, $df=1$, $p=0.6$
First Generation	38	34	$X^2=0.22$, $df=1$, $p=0.637$
Work: 0-19 hrs	58	42	$X^2=2.56$, $df=1$, $p=0.11$
Work: 20+ hrs	28	35	$X^2=0.78$, $df=1$, $p=0.378$

Table S2. Examples of coding student responses for which there were multiple content analysis codes.

Student response	Code
<p>It helped every person could reflect on their learning especially for those who are not comfortable in public speaking. All information could be exchanged and students were more prepared to answer. Focus and more effort was put in, and students were able to get out of their comfort zone</p>	<ul style="list-style-type: none"> - identify understanding - come prepared
<p>1) Being called on incentivized me to do my reading ahead of time so that I would be ready with an answer. As a result, I understood and retained the lecture material better, having prepared for it. 2) it kept my mind engaged and alert throughout class, should I need to answer for what I just heard. 3) It made my knowledge gaps visible to me so that I knew what questions I needed to begin asking myself to truly understand each topic.</p>	<ul style="list-style-type: none"> - identify understanding - come prepared - pay attention
<p>Time was wasted when people were called on who didn't know the answer, and it occurred somewhat frequently that several people would need to be called on before the correct answer would be given.</p>	<ul style="list-style-type: none"> - time away from learning - dualism (a response is either right or wrong)
<p>I have massive anxiety because I'm odd and sometimes I worry about being called on to answer a question that I wouldn't focus on what the instructor was saying at times. I would have to remind myself to pay attention and breathe.</p>	<ul style="list-style-type: none"> - social anxiety - anticipation distraction

Appendix B: Results

Table S3. Benefit and Interference code distribution based on the Type of Call a student was exposed to in class at the time of the survey. Students who did not answer the question (i.e., were coded as NA) were removed from the analysis; the sample size listed is after these NAs were removed. The most abundant code, when asked what interferences they anticipated when being called on was “being called on did not interfere.”

Question	Theme	Code	warm RC (n=269)	NotRC (n=168)	
Benefits		NA	7.6%	27.3%	
		Did not support	3.7% (10)	8.9% (15)	
	Engagement		Come Prepared	26.4% (71)	12.5% (21)
			Pay Attention	28.6% (77)	19.0% (32)
			Ready with Answers	1.9% (5)	0.0% (0)
			Participation	11.9% (32)	6.0% (10)
	Learning		Recall	4.1% (11)	10.1% (17)
			Understanding	15.6% (42)	24.4% (41)
			Practice Articulating	7.4% (20)	7.1% (12)
	Metacognition		Identify Understanding	16.0% (43)	17.9% (30)
			Develop Confidence	4.1% (11)	6.0% (10)

Table S3. continued

Question	Theme	Code	warm RC (n=265)	NotRC (n=176)
Interferences		NA	8.9%	23.8%
		Did not Interfere	40.0% (106)	50.6% (89)
	Frustration	Time Away from Learning	10.6% (28)	4.5% (8)
		Dualism	4.5% (12)	1.7% (3)
		Dominator	1.9% (5)	1.1% (2)
		Frustrated Dualism	1.9% (5)	0.0% (0)
		Interfere with Learning	0.4% (1)	0.0% (0)
	Distress	Social Anxiety	10.2% (27)	12.5% (22)
		Performance Anxiety	16.2% (43)	11.4% (20)
		Learning Anxiety	2.6% (7)	4.5% (8)
		Anticipation Distraction	6.4% (17)	4.0% (7)
		Skip Class	0.4% (1)	0.6% (1)

Figure S1. Students who did not learn English as their first language are less likely to report skipping class than report that they would participate without worry if they anticipated being called on in class. This effect is the same regardless of if the student was in a class that used warm RC or that did not use RC, thus warm RC/notRC is not shown here. These effects are summarized from the complete dataset and correspond to Table S3.

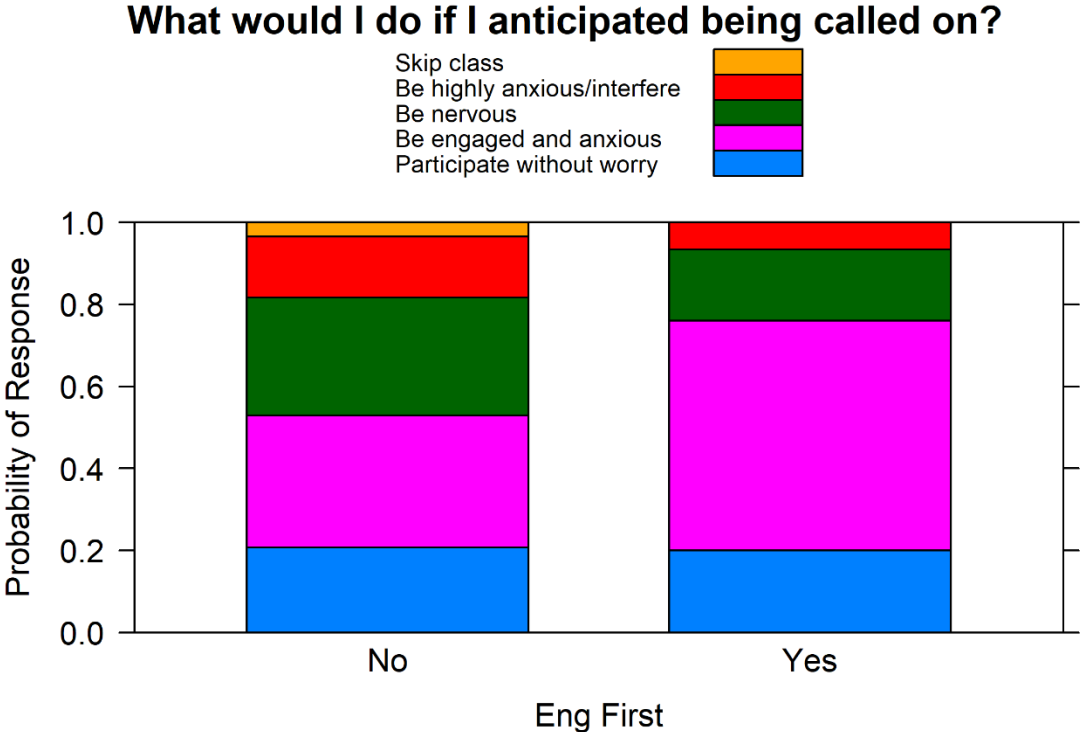


Figure S2. Benefit Code Distribution based on the type of call a student was exposed to in class at the time of the survey.

Students in classes that used warm random call were more likely to report codes relating to the Engagement Theme (E), less likely to report codes relating to the Learning Theme (L), and equally likely to report codes relating to the Metacognition Theme (M), compared to students in classes that did not use Random Call (Table 2, Table 7, Table S3, Figure 6). Note that models were not fit by code (only be theme) because of the small sample size within some codes (min=0, max=77, SD=21.5).

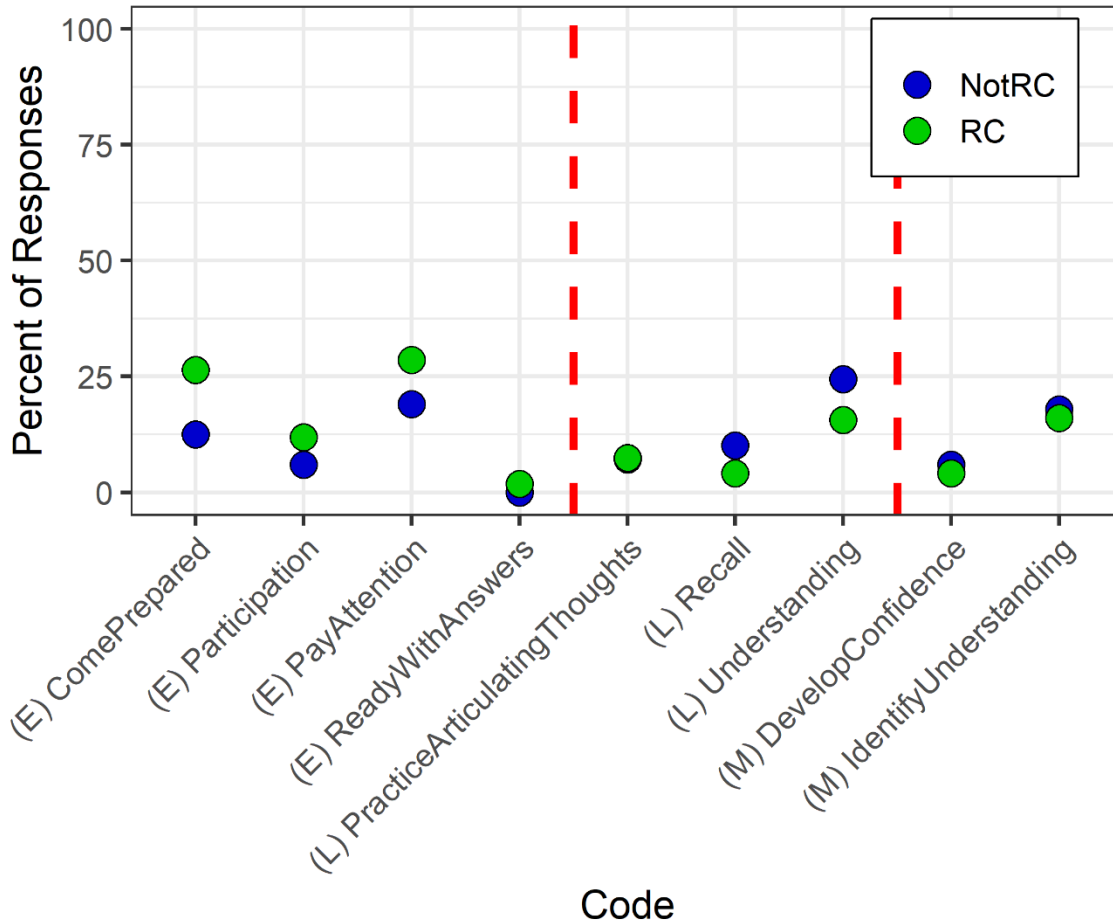


Figure S3. Interference Code Distribution based on the type of call a student was exposed to in class at the time of the survey. Students in classes that used warm random call were more likely to report codes relating to the Frustration Theme (F) and equally likely to report codes relating to the Distress Theme (D), compared to students in classes that did not use Random Call (Table 2, Table 7, Table S3, Figure 6). Note that models were not fit by code (only by theme) because of the small sample size within some codes (min=0, max=106, SD=28.0).

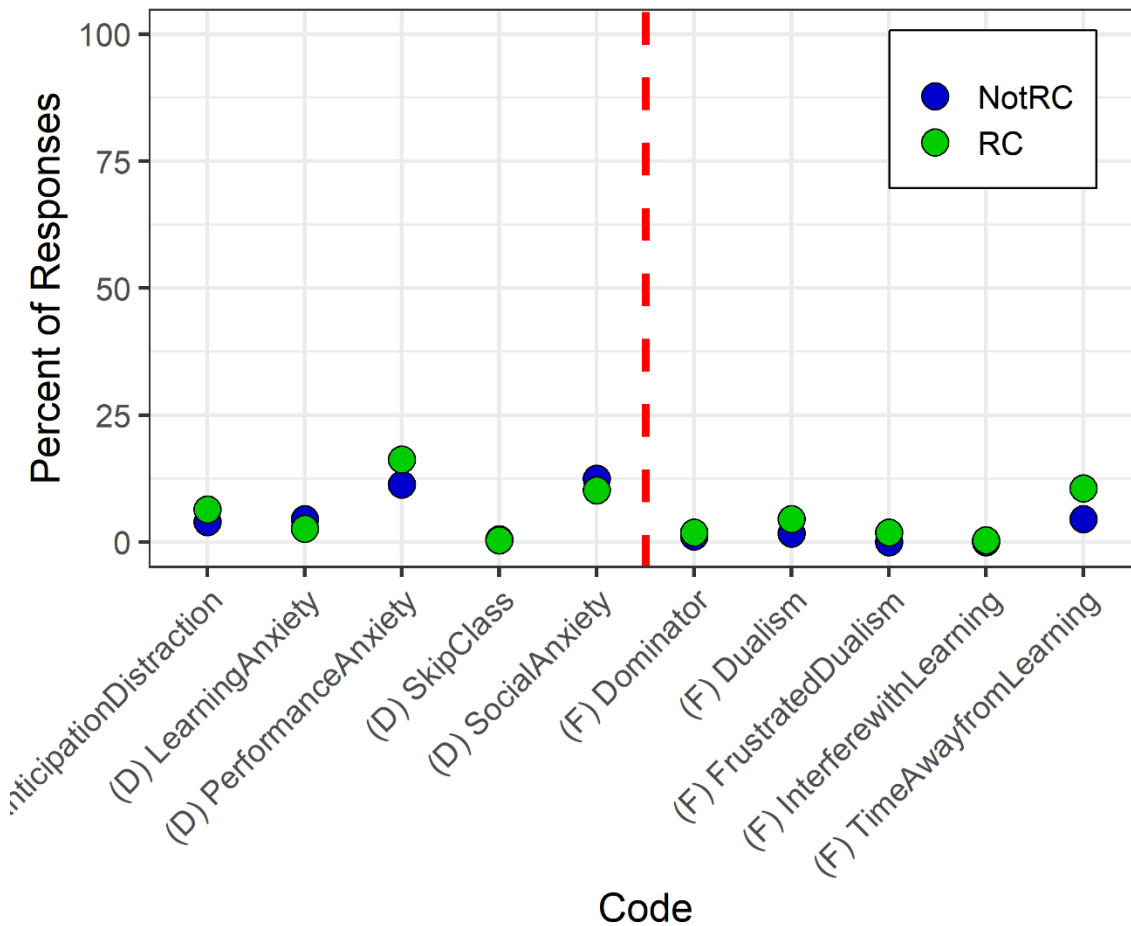


Table S4. Subsetted Data: The effects of warm random call and student identity on students if they anticipate being called on. Note: No students who reported learning English as their first language answered that they would skip class.

Values report odds-ratios and are relative to the reference group, “Participate without worry.” Significance tests come from Wald’s test: significance on Not Random Call estimates compare the value to zero thus are testing the null hypothesis that the given estimate is not different than the estimate of the reference, significance on Random Call estimates compare the warm Random Call estimate to Not Random Call estimate thus are testing the null hypothesis that there is no difference in the probability of selecting this level if a student is in a warm random call or a class that did not use random call. We tested for differential effects of warm random call on male vs. female students, on PEERs vs. nonPEERS, on First Generation vs. Continuing Generation students, on students who report learning English as their first language vs. students who report not learning English as their first language, and on students who work more than half time vs. less than half time. Sex, PEER status, and generational status were never retained in the final model.

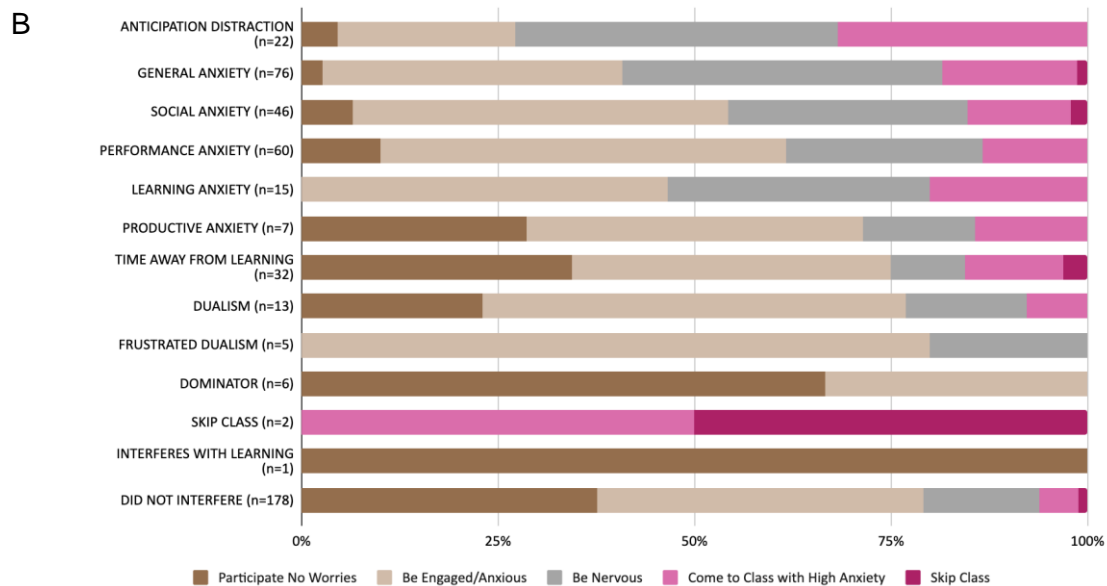
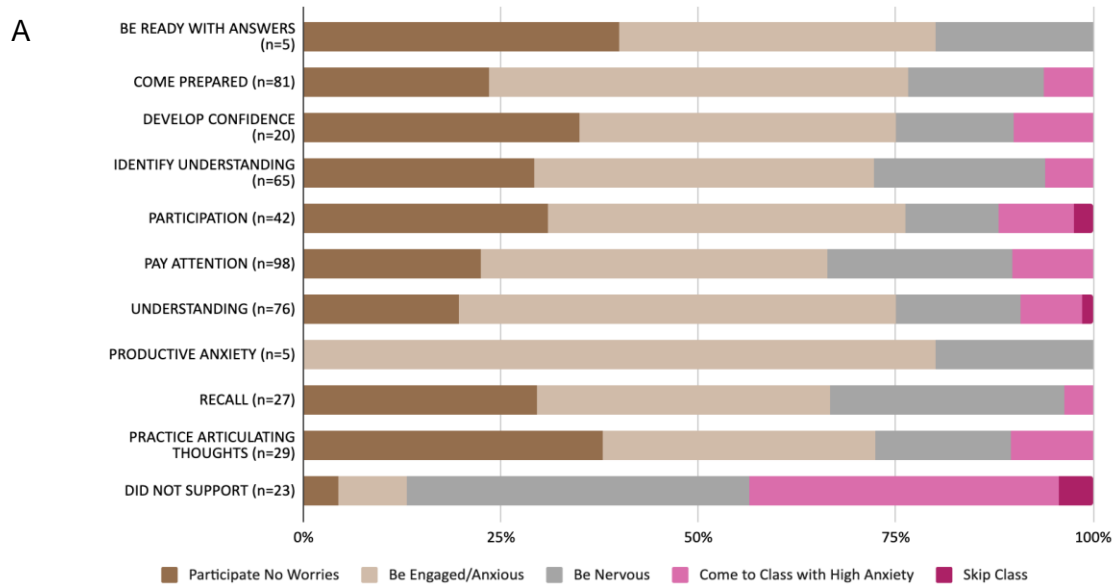
Level	Eng First: No	EngFirst: Yes
Engaged and Anxious	0.442 (0.302) 0.144	0.588 (0.426) 0.168
Nervous	0.329 (0.309) 0.288	-0.472 (0.489) 0.335
Highly Anxious with Interference	-0.325 (0.364) 0.371	-0.773 (0.632) 0.221
Skip Class	-1.792 (0.624) 4.063e ⁻⁰³	NA ^a

^aNo students who reported learning English as their first language answered that they would skip class.

Note: these Ns are very small

	Partic+no worries	AEn+Anx	BNervous	ChighAnx+interfere	DSkip
Eng No	18	28	25	13	3
Eng Yes	15	42	13	5	0

Figure S4. Benefit and interference codes and the students' categorical responses (colors within each bar) to the survey question "If I anticipate being called on in class, I am likely to ...". The codes for benefits (A) and interferences (B) are listed along the Y axis. n= the number of participants who had that code.



Appendix C: Instructor Slides to introduce ways of calling on students

Calling on Students Survey

General Study Question:

Student Attitudes regarding Random Call in Community College
Biology Courses

- Survey includes **all students at EdCC who are taking Biology courses.**
- Students will be **surveyed at the start and end of the quarter.**
- Students should be aware of the different ways that they are being called on in the classroom and the **type of calling their current instructor is using.**

Calling on Students

Instructors call on students to:

– promote **student engagement**

- Data supports the hypothesis that students learn more and get better grades when they actively participate in *class* (Eddy et al 2015).

– increase **preparation**

- Data supports the hypothesis that students are often more prepared for class when they understand they may be asked to contribute to discussion (Tanner 2015).

– inform instructors of **student understanding** of concepts and facts

- Data supports the hypothesis that feedback provides faculty a regular sightline into their students' progress towards [deeper learning](#) & informs our teaching (Novak & Patterson. 2010, [Just-in-time teaching](#)).

Calling on Students

When instructors call on students, we do **not** do so to:

- increase anxiety.
- make students feel uncomfortable or unintelligent.
- to “pick on” or punish students.

Ways to call on students

Volunteer Call vs. Random Call

- **Volunteer call:** instructors pose questions and students raise their hands to volunteer to be called on to answer the questions.
- **Random call:** Instructors pose questions and call on individual students from a deck of student cards or a randomized list.
 - **Cold Call:** Students will be called on *directly after question has been posed* without having a chance to discuss the question with their peers.
 - **Warm Call (aka Think-Pair-Share):** Students will be called on *after students had a chance to think and discuss the question with their peers*. This is sometimes called “cold call”
- **Group call:** Instructors post questions to a group and a designated or assigned person answers the question for the group.
- **Group Volunteer call:** Instructors pose a question to the whole class and students can call out answers.

Your instructor will NOT use “cold call.”

Calling on students in BIOL& _____

Most of the time, in this class your instructor will be using **(change criteria below according to your course)**

- **Volunteer call** - instructors pose questions and students raise their hands to volunteer to be called on to answer the questions.
- **Group Volunteer call:** Instructors pose a question to the whole class and students can call out answers.
- **Warm call** - instructors pose questions after students have had a chance to think and discuss the question with their peers.

Your instructor will NOT use “cold call”

References

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