

Supplemental Material

CBE—Life Sciences Education

Smith *et al.*

Classroom Observation Protocol for Undergraduate STEM – COPUS

Smith MK, Jones FHM, Gilbert SL, and Wieman CE. 2013. The Classroom Observation Protocol for Undergraduate STEM (COPUS): a New Instrument to Characterize University STEM Classroom Practices. CBE-Life Sciences Education

Date and time of Observation: _____

1) Background Information

a) **Observer Name:** _____

b) **Class No./name/section:** _____

c) **Observer's location in the class:** _____

2) Classroom and background

a) Room location and layout (e.g., type of student seating, instructor on podium, etc.).

b) Note if there is anything unusual about this particular class/lecture (e.g., quiz day, first day of semester, etc) (try to avoid observing classes that are particularly anomalous)

c) **(Optional, if known)** What goes on out of class? Homework? Pre-readings? Labs? Projects? Other?
Explain briefly.

d) **(Optional, if know)** How varied are classes for this course? Circle one each, to show balance of **Active Students / Instructor Delivery** ...

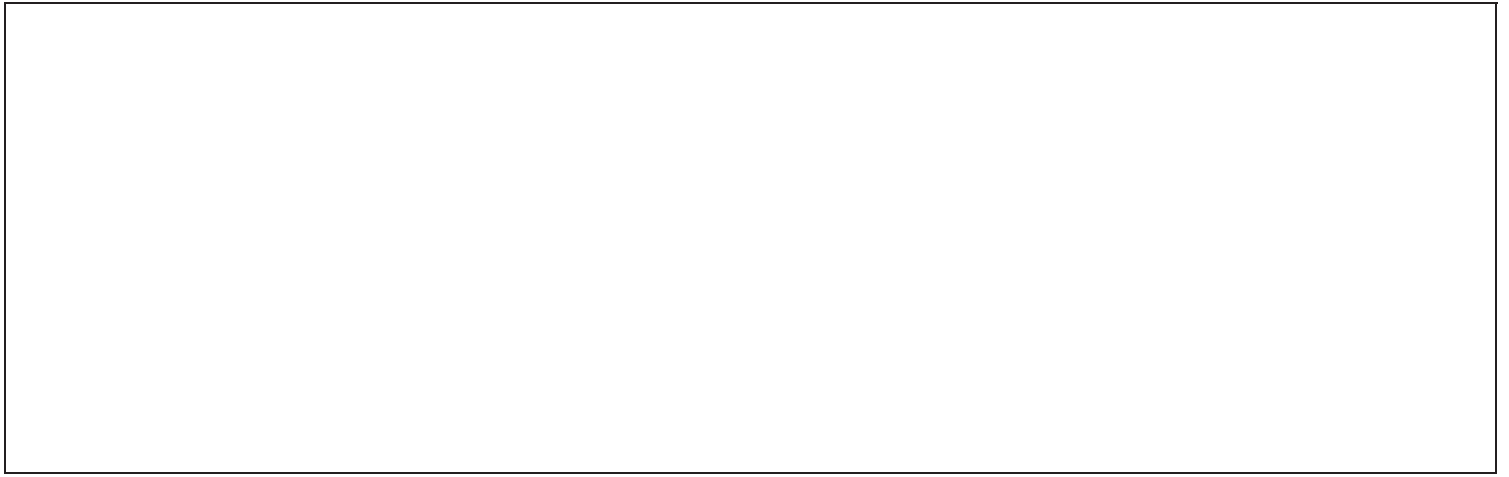
i) for the **Whole Course**, balance approximates: 0%/100% 20/80 40/60 50/50 60/40 80/20 100%/0%

ii) in **Today's Class Only**, balance approximates: 0%/100% 20/80 40/60 50/50 60/40 80/20 100%/0%

3) Narrative Description of Class (also known as field notes) (optional)

Information could include ...

- The structure of the lesson (e.g., how the instructor sequenced material, the narrative arc of the class)
- The range and nature of activities that occurred.
- Dialog/behaviors that illustrate codes you gave, especially for teaching techniques and student engagement.
- Instructor's actions that appear to have affected students' engagement.
- Evidence of variability among students (e.g., if small groups, to what extent did groups behave and engage similarly?)



Observation codes

1. Students are Doing

- L** Listening to instructor/taking notes, etc.
- Ind** Individual thinking/problem solving. Only mark when an instructor explicitly asks students to think about a clicker question or another question/problem on their own.
- CG** Discuss clicker question in groups of 2 or more students
- WG** Working in groups on worksheet activity
- OG** Other assigned group activity, such as responding to instructor question
- AnQ** Student answering a question posed by the instructor with rest of class listening
- SQ** Student asks question
- WC** Engaged in whole class discussion by offering explanations, opinion, judgment, etc. to whole class, often facilitated by instructor
- Prd** Making a prediction about the outcome of demo or experiment
- SP** Presentation by student(s)
- TQ** Test or quiz
- W** Waiting (instructor late, working on fixing AV problems, instructor otherwise occupied, etc.)
- O** Other – explain in comments

2. Instructor is Doing

- Lec** Lecturing (presenting content, deriving mathematical results, presenting a problem solution, etc.)
- RtW** Real-time writing on board, doc. projector, etc. (often checked off along with Lec)
- FUp** Follow-up/feedback on clicker question or activity to entire class
- PQ** Posing non-clicker question to students (non-rhetorical)
- CQ** Asking a clicker question (mark the entire time the instructor is using a clicker question, not just when first asked)
- AnQ** Listening to and answering student questions with entire class listening
- MG** Moving through class guiding ongoing student work during active learning task
- 1o1** One-on-one extended discussion with one or a few individuals, not paying attention to the rest of the class (can be along with MG or AnQ)
- D/V** Showing or conducting a demo, experiment, simulation, video, or animation
- Adm** Administration (assign homework, return tests, etc.)
- W** Waiting when there is an opportunity for an instructor to be interacting with or observing/listening to student or group activities and the instructor is not doing so
- O** Other – explain in comments

3. Student Engagement (optional)

- L** Small fraction (10-20%) obviously engaged.
- M** Substantial fractions both clearly engaged and clearly not engaged.
- H** Large fraction of students (80+%) clearly engaged in class activity or listening to instructor.

Student engagement alternatives:

- (1) Just mark when engagement is obviously high or obviously low.*
- (2) Count "N" students near you (~10) and assess how many appear engaged at every 2 minute interval. Enter value for all engaged instead of L/M/H. NOTE what your value of N was.*

Suggestions regarding codes and comments:

- Clarify code choices with comments.
- Consider indicating your confidence regarding coding, especially when you aren't sure about choice of codes.

HOW TO USE OBSERVATION MATRIX: Put a check under all codes that happen anytime in each 2 minute time period (check multiple codes where appropriate). If no codes fit, choose "O" (other) and explain in comments. Put in comments when you feel something extra should be noted or explained.

Date: _____ Class: _____ Instructor: _____ No. students _____ Arranged how? _____

1. **L**-Listening; **Ind**-Individual thinking; **CG**-Clicker Q discussion; **WG**-Worksheet group work; **OG**-Other group work; **AnQ**-Answer Q; **SQ**-Student Q; **WC**-Whole class discuss; **Prd**-Predicting; **SP**-Student present; **TQ**-Test/quiz; **W**-Waiting; **O**-Other

2. **Lec**-Lecturing; **RtW**-Writing; **FUp**-Follow-up; **PQ**-Pose Q; **CQ**-Clicker Q; **AnQ**-Answer Q; **MG**-Moving/Guiding; **1o1**-One-on-one; **D/V**-Demo+; **Adm**-Admin; **W**-Waiting; **O**-Other
 For each 2 minute interval, check columns to show what's happening in each category (or draw vertical line to indicate continuation of activity). OK to check multiple columns.

COPUS																																											
min	1. Students doing														2. instructor doing										3. Engagement			Comments: EG: explain difficult coding choices, flag key points for feedback for the instructor, identify good analogies, etc.															
	L	Ind	CG	WG	OG	AnQ	SQ	WC	Prd	SP	T/Q	W	O	Lec	RtW	Fup	PQ	CQ	AnQ	MG	1o1	D/V	Adm	W	O	L	M		H														
0 - 2																																											
2																																											
4																																											
6																																											
8 - 10																																											
	L	Ind	CG	WG	OG	AnQ	SQ	WC	Prd	SP	T/Q	W	O	Lec	RtW	Fup	PQ	CQ	AnQ	MG	1o1	D/V	Adm	W	O	L	M	H															
10 - 12																																											
12																																											
14																																											
16																																											
18 - 20																																											
	L	Ind	CG	WG	OG	AnQ	SQ	WC	Prd	SP	T/Q	W	O	Lec	RtW	Fup	PQ	CQ	AnQ	MG	1o1	D/V	Adm	W	O	L	M	H															
20 - 22																																											
22																																											
24																																											
26																																											
28 - 30																																											

1. **L**-Listening; **Ind**-Individual thinking; **CG**-Clicker Q discussion; **WG**-Worksheet group work; **OG**-Other group work; **AnQ**-Answer Q; **SQ**-Student Q; **WC**-Whole class discuss; **Prd**-Predicting; **SP**-Student present; **TQ**-Test/quiz; **W**-Waiting; **O**-Other
2. **Lec**-Lecturing; **RtW**-Writing; **FUp**-Follow-up; **PQ**-Pose Q; **CQ**-Clicker Q; **AnQ**-Answer Q; **MG**-Moving/Guiding; **1o1**-One-on-one; **D/V**-Demo+; **Adm**-Admin; **W**-Waiting; **O**-Other

For each 2 minute interval, check columns to show what's happening in each category (or draw vertical line to indicate continuation of activity). OK to check multiple columns.

page 2		1. Students doing													2. instructor doing										3. Engagement			Comments: EG: explain difficult coding choices, flag key points for <u>feedback for the instructor</u> , identify good analogies, etc.						
min		L	Ind	CG	WG	OG	AnQ	SQ	WC	Prd	SP	T/Q	W	O	Lec	RtW	Fup	PQ	CQ	AnQ	MG	1o1	D/V	Adm	W	O	L		M	H				
30 - 32																																		
32																																		
34																																		
36																																		
38 - 40																																		
		L	Ind	CG	WG	OG	AnQ	SQ	WC	Prd	SP	T/Q	W	O	Lec	RtW	Fup	PQ	CQ	AnQ	MG	1o1	D/V	Adm	W	O	L	M	H					
40 - 42																																		
42																																		
44																																		
46																																		
48 - 50																																		

Further comments:

If you would like to have a protocol sheet that extends beyond 50 minutes, please check the following website: www.cwsei.ubc.ca/resources/COPUS.htm or contact the corresponding author (michelle.k.smith@maine.edu) for a modifiable spreadsheet.

COPUS Training Guide

1. 10 mins. Introductions and brief rationale for exercise and overall goals.
2. 15 mins. Hand out paper copies of protocol and code explanations. Allow participants to read them over. Project the code explanations. Discuss the codes as a group and answer any questions.
3. 5–10 mins. Show two minutes of a video that is straightforward to code (mostly lecture, administrative announcements). Observers individually mark their paper copy of the protocol. Stop after two minutes and have a group discussion about the codes they selected. Which codes chosen for students? For instructor? How many for each?
4. 8 mins. Now group the observers in pairs and have the two observers sit near each other. Play a video for ~8 minutes and have observers record what is going on in 2-minute segments on the paper copy of the protocol. In order to keep all observers in sync, use either a shared two-minute sand timer or a stopwatch counting up (this feature is often found on cell phones).
5. 10 mins. Have the observer pairs first compare notes with each other for the 8 minute segment and then have a discussion with the larger group. For the group discussion, observers take turns volunteering what they coded for the students and the instructors every two minutes for the 8-minute clip. Discuss any codes that were unclear. For example, observers often want to clarify when to mark the student code “OG Other group activity” and how that differs from having students discuss a clicker question or work on a worksheet. It is also recommended to discuss the instructor code “FUp Follow up” and the importance of marking “PQ Posing non-clicker question to students” if the instructor follows up by posing questions to students. Observers may also talk about the relationship between some student and instructor codes. For example, if observers mark “CG students discussing a clicker question,” they will also likely mark the instructor code “CQ Asking a clicker question.”
6. 15 mins. Have observer pairs code two minutes of a video segment that shows students and instructors showing multiple behaviors such as asking and answering questions, small group activities, and/or discussing clicker questions. After two-minutes have the pairs compare codes and discuss the results with the larger group. Then have observers code the next 6 minutes (8 minutes total of this segment of the class). Again have pairs compare answers and discuss the answers as a whole group volunteering what they coded for the students and the instructors every two minutes for the 8-minute clip.
7. 10 mins. Organize pairs and select classes to observe. Plan a way to collect data from observers (collect paper copies, fill in the information on an on line

form). If possible, meet with observers after they have collected data to share aggregate results and talk through any codes that were causing difficulties.

8. If you have two observers in a classroom and would like to calculate inter-rater reliability (IRR), for all 25 codes add up all the total number of times: 1) both observers put a check in the same box, 2) neither observer put a check in the same box, 3) observer 1 put a check in a box when observer 2 did not, and 4) observer 2 put a check in a box when observer 1 did not. With this information, you can use a statistical package such as SPSS (IBM Inc.) to calculate the Kappa values.