

Instructor Guidelines for Using COPUS Data to Inform and Represent their Teaching Practices

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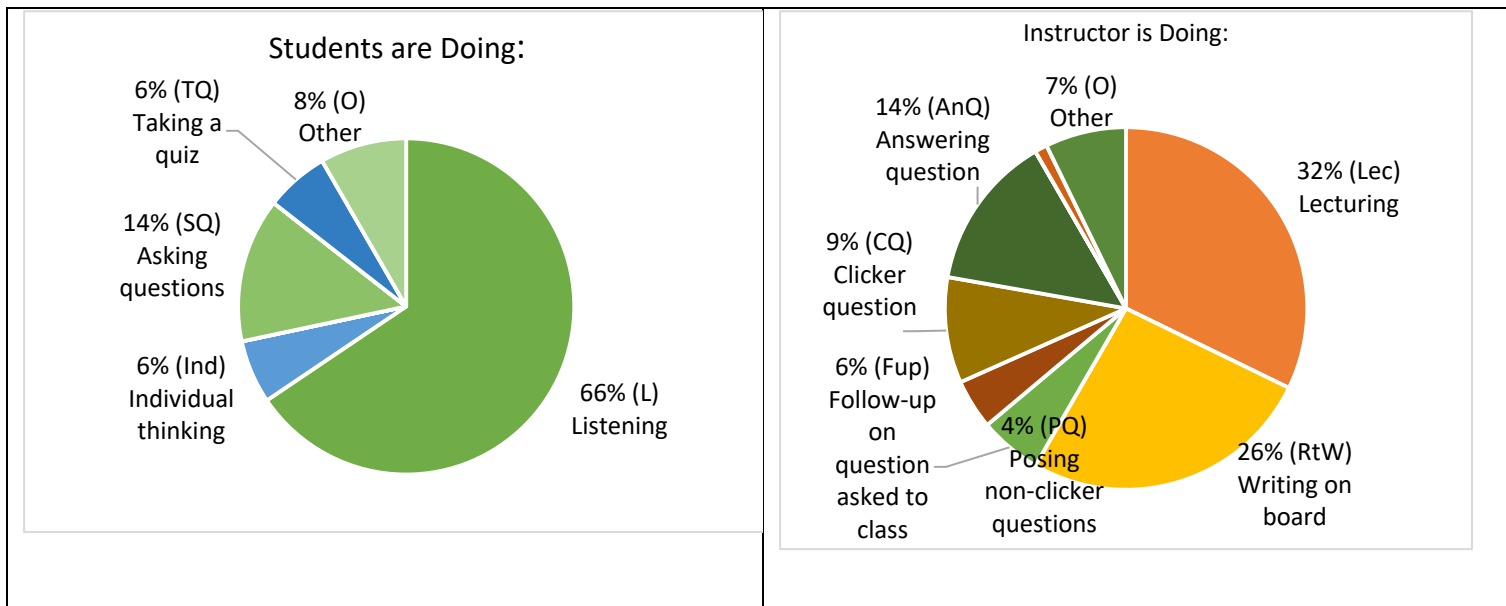
Overview

The goal of this document is to provide guidance to instructors using COPUS data to inform and represent their teaching practices. The information has been gathered from current articles and examples to respond to frequent questions instructors might have on how codes are collapsed into four main categories, use graphs and table to illustrate the data, and compare with other national measures. It includes references to resources where instructors can find more detailed information about the guidelines provided.

What is COPUS?

The Classroom Observation Protocol for Undergraduate STEM (COPUS) is a tool to collect information about what is happening in the classroom (Smith et al. 2013 CBE-LSE). Over the course of a class period, instructor and student behaviors and interactions are observed over two-minute time intervals. Data are then analyzed and reported in a document noting how much time (as a percentage of two-minute intervals) each of the behaviors and interactions was observed. These data help instructors identify how much time is spent on each behavior and their practices utilized during class time (Reisner, 2020).

How do I interpret my COPUS data?



The pie charts in the COPUS report are used to visualize and quantify the percentage of two-minute intervals during which each behavior corresponding to a COPUS code was observed. The representations could help you answer the following questions:

- 1) *Do these data match my perceptions of what is happening in my classroom?*
- 2) *How am I utilizing my class time?*

Based on Stains et al. (2018), there are three broad profiles: 1) didactic, 2) interactive-lecture, and 3) student-centered. “Didactic” class periods are typically lecture-focused (>80% of time spent lecturing); in “interactive-lecture” class periods, lecture is still the key instructional strategy, but it is supplemented with more student-centered strategies like group work. For “student-centered” class periods, time is focused on small group work where the social construction of knowledge is a key instructional strategy; the instructor typically moves throughout the class with the amount of time devoted to lecture dramatically reduced as compared to didactic and interactive-lecture class period. These profiles provide insights into the predominant instructional practices during a class period. Research shows (e.g., Connell & colleagues, 2016, Freeman & colleagues, 2014) that incorporating student-centered instructional practices where student actively construct their understanding through interactions with each other and the instructor improves student performance outcomes.

What if the day that I was observed isn’t how I normally teach?

Multiple samples are more representative than a single sample, especially when we vary our instruction on the basis of content and the focus of the specific class period (e.g., review session for an exam). Thus, if only one class period is observed, the COPUS profile should not be assumed to be representative of all class periods for the course. You will need three to four COPUS observations to be able to draw some conclusions on the results.

How can I make the most of the COPUS results that I have received from SATAL?

COPUS data could be used for three different functions: (1) to provide feedback to instructors about the level of engagement of their students given their teaching practices; (2) to provide evidence of teaching effectiveness for merit, promotion, and tenure cases and teaching awards; and (3) to support science education research on teaching and learning practices.

(1) Feedback on the level of student engagement given the instructional practices selected.

How do I use these data to inform my instruction?

What do I do if my perceptions do not match what is in my COPUS data?

Take a few minutes to think happened during the observed class period. What did you as the instructor do? How long did these actions last? What did the students in the class do? For how long? How did your choice of instructional strategies relate to the skills and content being taught? Answers to these questions will provide a comparison for how your perceptions match reality. If there is a disconnect between your answers and the observation data, think about how you would like to spend your time and effort, and then incorporate more of the practices you would like to see.

Based on his behavioral science research, Dr. Fogg suggests making ‘small changes’ at a time and build off of small changes over time (2020). We can apply Fogg Behavior Model to teaching behaviors. When addressing the COPUS codes, identify ONE instructor’s behavior you are already implementing and ‘anchor’ that behavior to ONE student behavior that you can add to your teaching practices. For instance, when using demos (D/V) in your class, you could plan on adding Predict (P). If every time you include a D/V, you anchor it to the student code P, over time, presenting a V/D to the class will prompt you to ask the students to P. When that ‘tiny habit’ is built, you can move to another ‘small change’.

How can I use COPUS data to follow changes in my teaching practice?

Maybe your interest in having your class observed is to incorporate more evidence-based instructional strategies where students work together to construct their knowledge into your class periods. Or, maybe your ideal class period involves minimizing introductory remarks and getting to the engaging activities earlier in class periods. The COPUS data and analyses provide a measure of the amount of your class period that you spend on student-centered activities so you can structure your class to spend more time on these activities and follow your changes over time.

What can I do if I don’t like what I see in my data?

Recognizing dissatisfaction with your teaching is a critical step toward making change. The Center for Engaged Teaching and Learning (CETL) on campus will be able to provide resources for making concrete course changes. Here is the CETL website to consult with us at <https://cetl.ucmerced.edu>

(2) Evidence of teaching effectiveness for merit, promotion, and tenure cases and teaching awards

How do I present the COPUS information?

There are a few options to present the information effectively.

Use graphs, tables, and benchmark data

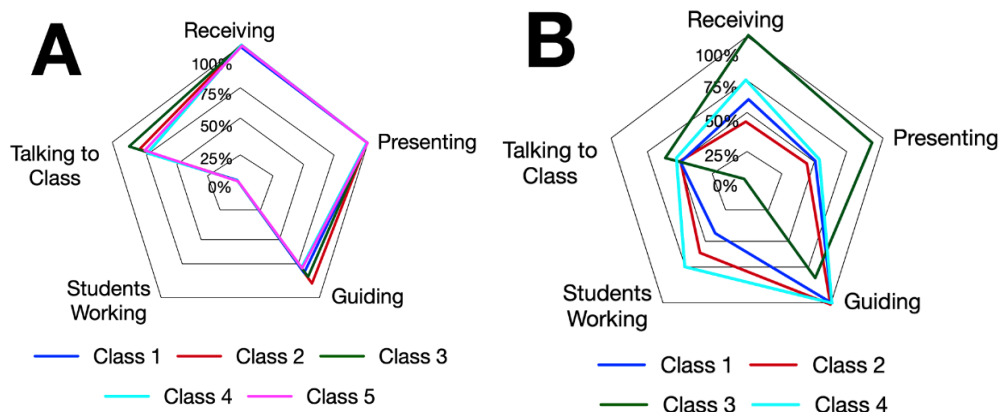
- A. You could present the individual pie charts provided in the COPUS reports side by side (students & instructors) and arranged in chronological order to demonstrate the changes implemented and improvements through time.
- B. To better have a general sense of the trends in student and instructor when comparing COPUS codes in your course, in addition to looking at all codes individually, you can collapse them into four categories describing what the students are doing and four categories describing what the faculty are doing (Smith and colleagues, 2014). The four instructor code categories include: 1) Presenting, 2) Guiding, 3) Administration, and 4) Other. The four student code categories include: 1) Receiving, 2) Students Talking to Class, 3) Student Working, and 4) other as indicated in the Table 1 below.

Table 1. Description of the collapsed COPUS codes based on Smith et al. 2014

| | Collapsed codes | Individual codes |
|----------------|------------------------|--|
| Instructor is: | Presenting (P) | Lec: Lecturing or presenting information RtW: Real-time writing |
| | Guiding (G) | D/V: Showing or conducting a demo, experiment, or simulation FIUp: Follow-up/feedback on clicker question or activity PQ: Posing nonclicker question to students (nonrhetorical) CQ: Asking clicker question (entire time, not just when first asked) AnQ: Listening to and answering student questions to entire class MG: Moving through class guiding ongoing student work 1o1: One-on-one extended discussion with individual students |
| | Administration (A) | Adm: Administration (assign homework, return tests, etc.) |
| | Other (OI) | W: Waiting (instructor late, working on fixing technical problems) O: Other |
| Students are: | Receiving (R) | L: Listening to instructor |
| | Talking to class (STC) | AnQ: Student answering question posed by instructor SQ: Student asks question WC: Students engaged in whole-class discussion SP: Students presenting to entire class |
| | Working (SW) | Ind: Individual thinking/problem solving CG: Discussing clicker question in groups of students WG: Working in groups on worksheet activity OG: Other assigned group activity Prd: Making a prediction about a demo or experiment TQ: Test or quiz |
| | Other (OS) | W: Waiting (instructor late, working on fixing technical problems) O: Other |

C. Scatter plots or radar plots, as in Reisner and colleagues (2020, p. 1184-5), can be used to depict multiple class period observations. The radar plots below depict four or five observations made for two different instructors. When there is overlapping of lines in the plot, then this suggests consistency in instruction across multiple observations (Figure 1. A). However, when the lines are not overlapping, then this suggest there is variation in instruction across multiple observations (Figure 1. B).

Figure 1. Radar plot of two different instructors with 5 (A) or 4 (B) observations.



D. When observed more than once, you can average your class sessions to identify how much class time you and your students are spending in each of the categories as represented in in table 2. In addition, you will add comments on what went well and what the changes you would like to implement in the future to improve student engagement. Furthermore, you can compare your results to Stains et al., 2018’s data from 500

observed faculty across 25 North American institutions finding out that on average STEM instructors lecture for 74.9% of their time.

Table 2 summarizes how much time was spent on each code and category.

| Instructor is doing: | | Mean (%) | Mean (Min) |
|----------------------|---|----------|------------|
| Guiding | | | |
| FUp | Follow-up on question asked to class | 6% | 4 |
| PQ | Posing non-clicker questions | 3% | 2 |
| CQ | Clicker question | 32% | 24 |
| MG | Moving around guiding students | 25% | 19 |
| AnQ | Answering question | 6% | 4 |
| 101 | 1-on-1 discussion with a student or group | 0% | 0 |
| Presenting | | | |
| Lec | Lecturing | 16% | 12 |
| RtW | Writing on the board | 0% | 0 |
| D/V | Showing a video/conduct. a demo | 4% | 3 |
| Administering | | | |
| Adm | Administration | 7% | 6 |
| Other | | | |
| W | Waiting | 0% | 0 |
| O | Other | 0% | 0 |

| Students are doing: | | Mean (%) | Mean (Min) |
|---------------------------------------|---------------------------------------|----------|------------|
| Working & Talking to Class | | | |
| Ind | Individual thinking | 7% | 6 |
| AnQ | Answering questions | 3% | 2 |
| OG | Other group activity | 10% | 8 |
| CG | Discussing clicker question | 10% | 8 |
| SQ | Asking questions | 16% | 12 |
| WC | Whole class discussion | 0% | 0 |
| WG | Group worksheet | 18% | 13 |
| Prd | Predicting outcome of demo/experiment | 0 | 0 |
| SP | Student presentation | 0% | 0 |
| Receiving | | | |
| L | Listening | 22% | 17 |
| Assessment | | | |
| TQ | Taking a quiz | 7% | 6 |
| Other | | | |
| W | Waiting | 1% | 1 |
| O | Other | 3% | 2 |

Overall, instructors will demonstrate a range of teaching practices that a. impact the student experience, b. are generally, but not always, influenced by class size when selecting practices, and c. have an awareness of how often they use specific teaching practices in their courses.

(3) Support science education research into teaching and learning practices

How do I complete the assessment loop?

- The COPUS tool was designed to be informative and provide a means to understand what behaviors are taking place during instruction. When viewed as a mechanism to reflect on our teaching and provide baseline data to make instructional changes, the COPUS tool can be central to improving our courses and documenting the impact of your teaching practices in a manuscript publication.
- Also, as mentioned before, repeatability and reproducibility are critical to scientific investigations. Stains et al. (2018) discovered that when instructors have four or more class periods observed, the majority (75%) of instructors have more than one COPUS profile assigned for the observed class periods; only one-in-four instructors had the same instructional profile observed across all four or more observed class periods. To capture teaching practices that are indicative of the class as a whole, rather than a particular class

meeting, three to four observations need to be collected to draw some conclusions on the instructional practices.

- If your goal is to contribute to the discipline-based education research, then please contact the UC Merced Office of Research Compliance and Integrity to get further information about the human-subject research, specifically the IRB process. Here is a link with information about this process: <https://rci.ucmerced.edu/irb>. Also, if you are interested in utilizing the CETL centralized IRB proposal for your research, contact Adriana Signorini.

For more information about how to use your COPUS data to inform and represent your COPUS results, contact Adriana Signorini, SATAL coordinator (asignorini@ucmerced.edu).

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