Classroom Observation Protocol for Undergraduate STEM (COPUS)

A brief introduction to COPUS and how it is being utilized for the TRESTLE project

- Developed as part of the Carl Wieman Science Education Initiative
  http://www.cwsei.ubc.ca/

- Adapted from the Teaching Dimensions Observation Protocol (TDOP)
  - M.T. Hora, A. Oleson, J.J. Ferrare, Wisconsin Center for Education Research, University of Wisconsin–Madison

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Description

- Protocol to objectively capture live classroom activities
- Records student and instructor actions
- Does not assign quality ratings
- Requires an observer coming to the classroom
- Observers require training (2 hours in person and 2 hours at home)

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Using COPUS Data

- COPUS data provides quantitative information to document teaching practices. It can be used at the individual, departmental, or institutional level.

- In conjunction with student assessment data, COPUS may provide opportunities to compare the impact of different teaching practices.

- Instructors may use COPUS data in diverse ways. For example, instructors may use the information in their teaching portfolios as measurable evidence of their pedagogical approaches (e.g., the encouragement of student problem solving, group work, open discussions, etc.).

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The Impact of Measurable Teaching

Objective descriptions of instructional practice, such as COPUS, have many applications:

- *To provide rich insights of teaching practice at departmental and/or institutional levels…* to provide more accurate and detailed accounts of teaching that could be used to track changes in instruction over time, to evaluate the efficacy of instructional interventions, and to generally increase administrators' appreciation for the types of instruction taking place in their departments and institutions.
- *To provide more accurate accounts of classroom teaching for policy makers…* [to gain a more holistic understanding of classroom dynamics and needs]

Hora, Matthew T. and Joseph J. Ferrare. "Remeasuring Postsecondary Teaching: How Singular Categories of Instruction Obscure the Multiple dimensions of Classroom Practice." *Journal of College Science Teaching* 43, 3 (2014): 36-41.

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The Impact of Measurable Teaching

Objective descriptions of instructional practice, such as COPUS, have many applications (continued):

- *To explore the relationships between classroom teaching and student learning…* [In addition to student feedback and learning outcomes] data would shed light on the types of instruction (e.g., lecturing) that students perceive as being the most beneficial for their own studying and learning.
- *To inform faculty professional development sessions…* [with] a detailed account of teaching…while avoiding a priori judgements about the quality of an instructor's teaching… [To] be used to spark self-reflection for individual faculty and as a way for faculty developers to gauge an individual's progress or growth over time.

Hora, Matthew T. and Joseph J. Ferrare. "Remeasuring Postsecondary Teaching: How Singular Categories of Instruction Obscure the Multiple dimensions of Classroom Practice." *Journal of College Science Teaching* 43, 3 (2014): 36-41.

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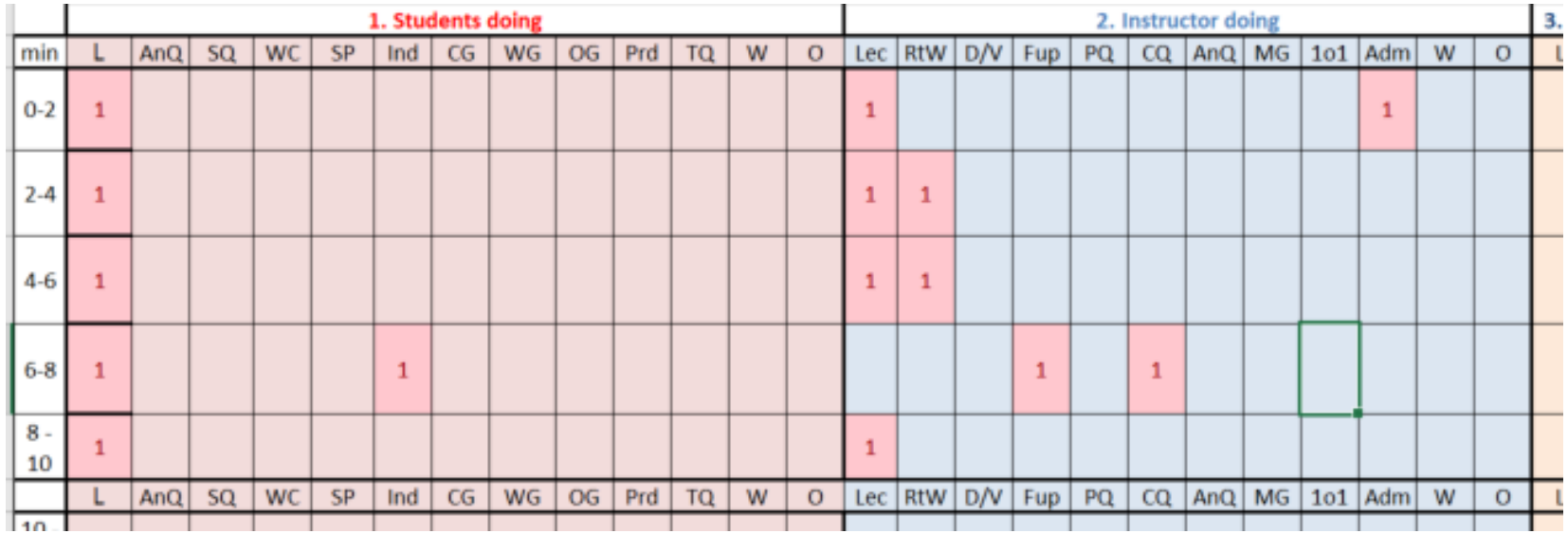
How it Works…

Course observations are organized into 2-minute increments. Using a timer, the activities of both students and instructors are coded into 25 categories. For the TRESTLE project, data is being collected and aggregated using the COPUS visualization sheets created by The Teaching Engagement Program at the University of Oregon (http://tep.uoregon.edu/resources/index.html)

Some campuses are also utilizing GORP (General Observation and Reflection Platform) to collect observation data in the classroom. GORP is an online adaptation of the COPUS developed by TRESTLE partner UC-Davis.



	1. Students doing													2. Instructor doing											3.
min	L	AnQ	SQ	WC	SP	Ind	CG	WG	OG	Prd	TQ	W	O	Lec	RtW	D/V	Fup	PQ	CQ	AnQ	MG	1o1	Adm	W	O	L
0-2	1													1									1			
2-4	1													1	1											
4-6	1													1	1											
6-8	1					1											1		1							
8 - 10	1													1												
	L	AnQ	SQ	WC	SP	Ind	CG	WG	OG	Prd	TQ	W	O	Lec	RtW	D/V	Fup	PQ	CQ	AnQ	MG	1o1	Adm	W	O	L

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Student Activity Codes

Code	Students are Doing
L	Listening to instructor/taking notes, etc.
AnQ	Student answering a question posed by the instructor with rest of class listening.
SQ	Student asks question in front of the large group.
WC	Engaged in whole class discussion by offering explanations, opinion, judgment, etc. to whole class, often facilitated by instructor.
SP	Presentation by student(s)
Ind	Individual thinking/problem solving.
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.
Prd	Making a prediction about the outcome of demo or experiment
TQ	Test or quiz.
W	Waiting (instructor late, working on fixing AV problems, instructor otherwise occupied, etc.)
O	Other – explain in comments.

M. K. Smith, E. L. Vinson, J. A. Smith, J. D. Lewin, & M. R. Stetzer (2013). *A Campus-Wide Study of STEM Courses: New Perspectives on Teaching Practices and Perceptions,* CBE-Life Sciences Edu, 13(4), pp. 624–635.

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Instructor Activity Codes

Code	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).
D/V	Showing or conducting a demo, experiment, simulation, video, or animation.
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 (students), not paying attention to the rest of the class (can be along with MG or AnQ).
Adm	Administration (assign homework, return tests, etc.)
Si	Stretch-it: Student follow up—a series of questions targeted to an individual student to really flesh out their thinking on an idea or topic.
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.

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***SI not currently used for the TRESTLE project**

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TRESTLE Process and Results

- At least three observations are conducted over the course of the semester. At least one of these observations include two researchers co-observing to ensure reliability and consistency across the research team.

- After the observations are complete, the University of Kansas sends a report to the instructor that includes graphs of the observation data.

- The following slides provide examples.

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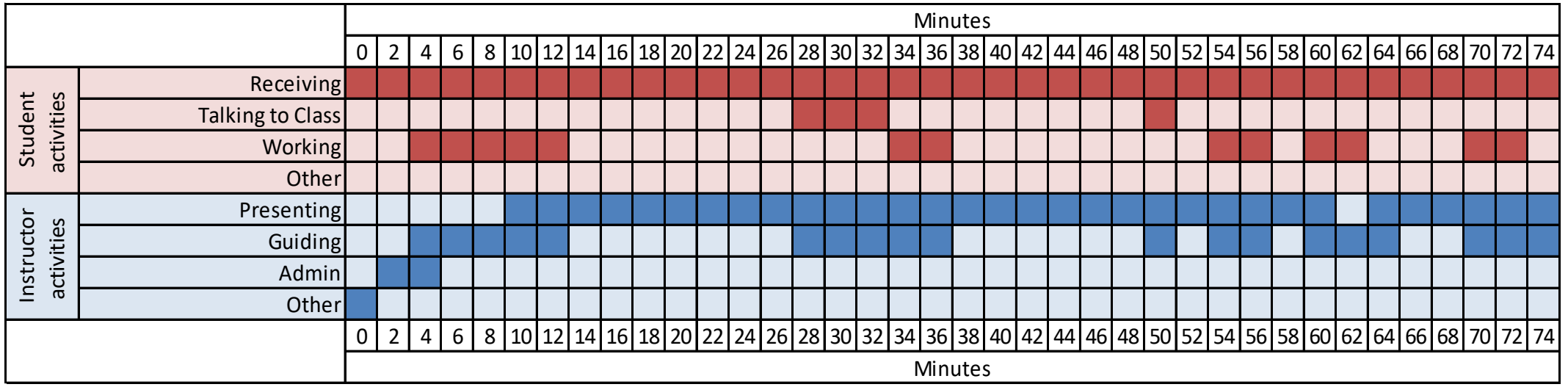
Tracking Activities by Time

- The graph below reflects student and instructor activities that occurred during each 2-minute time interval across one class period. The activities in this first chart are grouped into eight simplified categories (as described to the right). Columns show the time periods in which a given activity occurred. Rows show which activities were marked in each time interval.
- The dark shaded squares indicate that the activity occurred at some point during the 2-minutes interval. It does not indicate that the activity occurred for the entire 2-minute interval.

Instructor Activities	Categories included
Presenting	Lecturing or presenting information (Lec), Real-time writing (RtW), Demonstration/Video (D/V)
Guiding	Follow-up/feedback on activity (FUp), Pose question (PQ), Pose clicker question (CQ), Listening to and answering student questions (AnQ), Moving and Guiding (MG), One on one discussion (1o1)
Admin.	Administration (Adm)
Other	Waiting (W) or Other (O)
Student Activities	**Categories included**
Receiving	Listening to instructor (L)
Talking to Class	Student answering question (AnQ), Student asking question (SQ), Whole-class discussion (WC), Students presenting to entire class (SP)
Working	Individual thinking (Ind), Discussing clicker question (CG), Working in groups on worksheet (WG), Other group activity (OG), Making prediction (Prd), Test/Quiz (TQ)
Other	Waiting (W), Other (O)

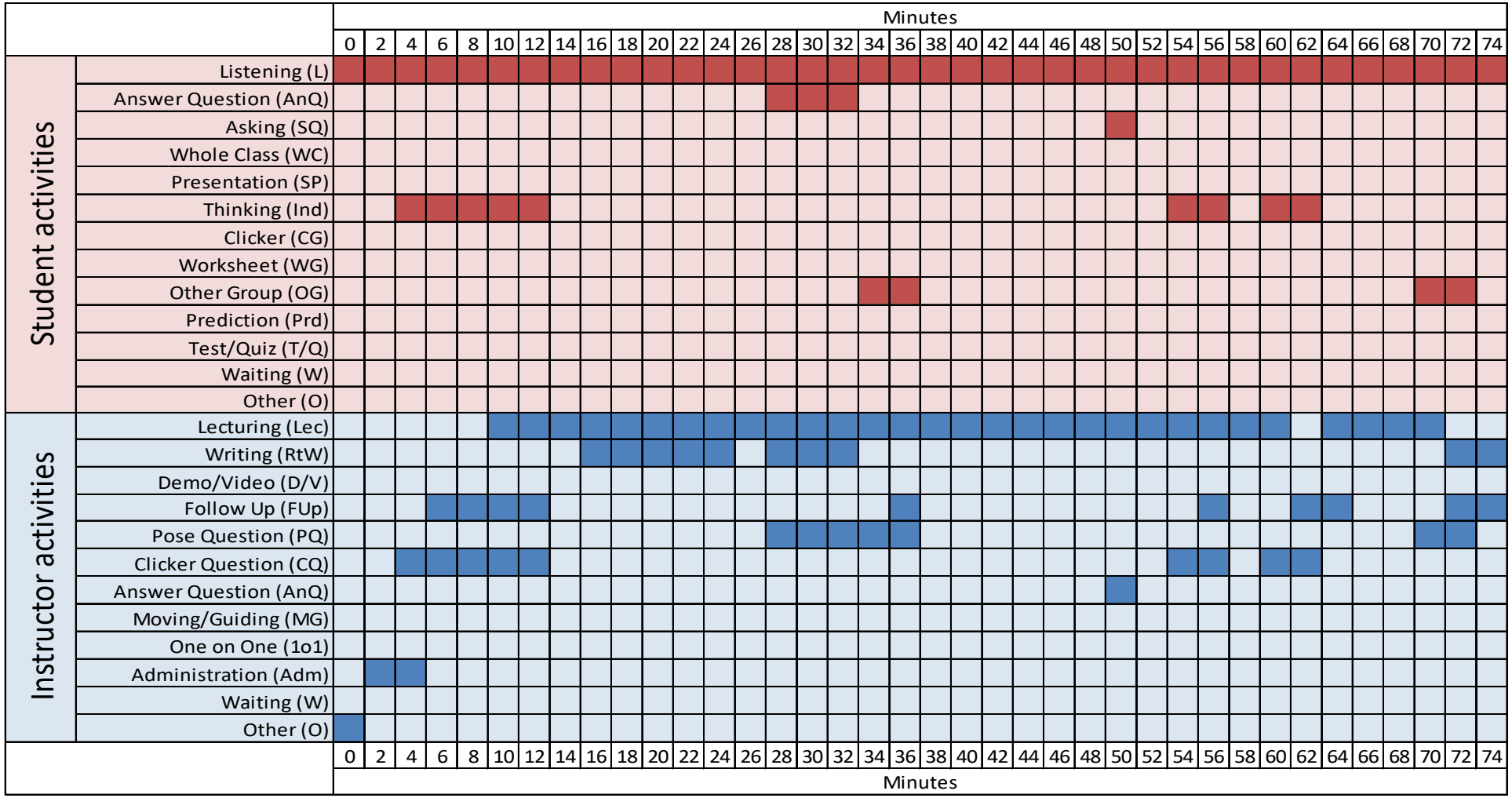
*From M. K. Smith, E. L. Vinson, J. A. Smith, J. D. Lewin, & M. R. Stetzer (2013)



*COPUS visualization template provided by The Teaching Engagement Program at the University of Oregon: http://tep.uoregon.edu/resources/index.html

Occurrence of Activity by Time

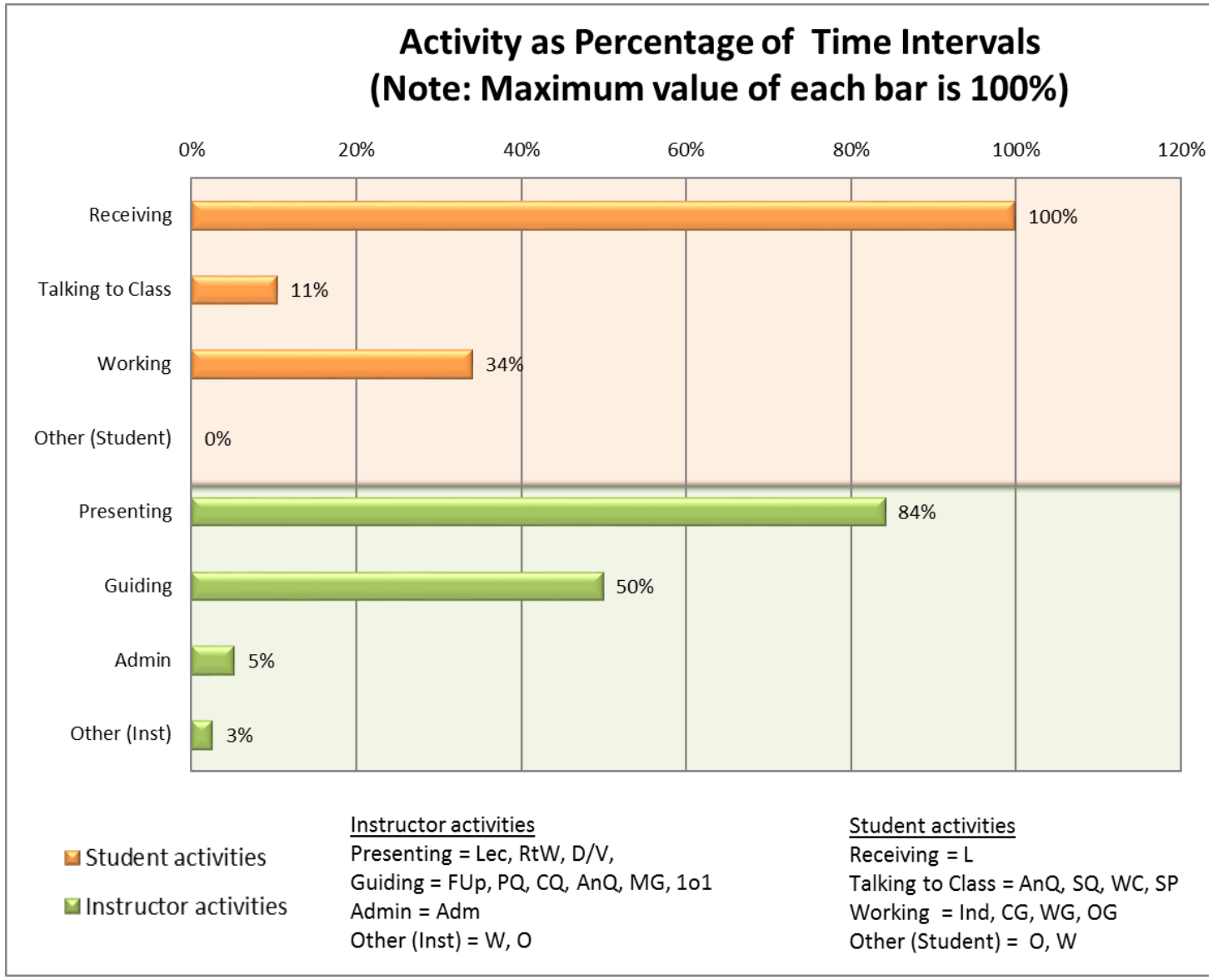
- The figure below shows which activities occurred in each 2-minute time interval using the full 25 categories to capture which specific activities occurred.



*COPUS visualization template provided by The Teaching Engagement Program at the University of Oregon: http://tep.uoregon.edu/resources/index.html

Activity as Percentage of Time Intervals #1

- This figure shows the percentage of time each activity occurred for the length of the class period using the collapsed codes.
- Again, it only indicates that the activity occurred for at least a portion of that interval.



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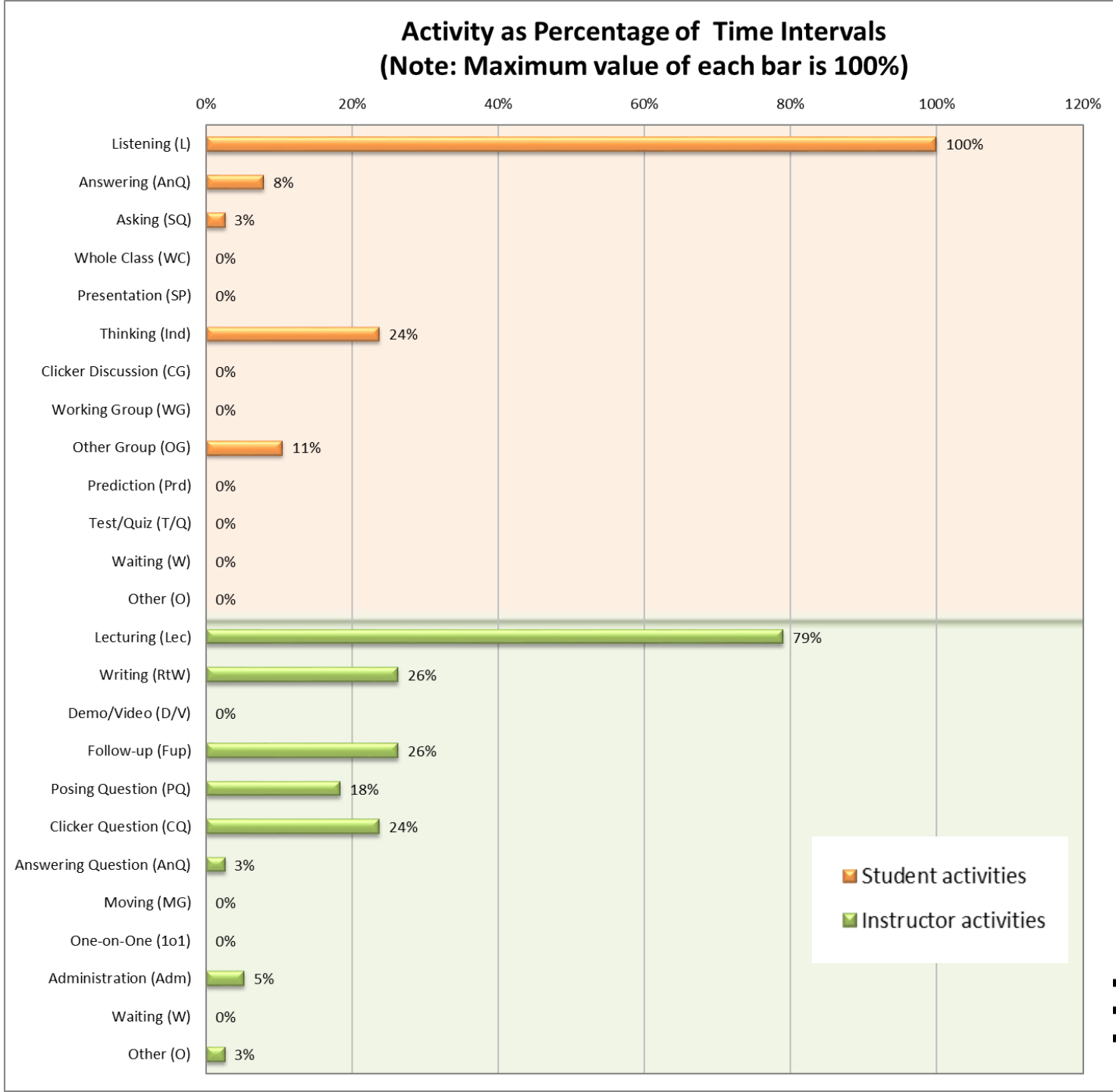
Activity as Percentage of Time Intervals #2

This figure shows the percentage of time each activity occurred for the length of the class period with the full code listing.



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Training

- At the University of Kansas, TRESTLE undergraduate research assistants (URA's) receive an initial orientation with information on the general COPUS protocol, including instruction on how to categorize classroom action into codes. Using previously recorded materials, URA's watch videos of classroom instruction and practice coding under the guidance of an experienced COPUS observer.

- URA's next complete practice videos on their own, and must receive at least a 0.8 Kappa Score before entering the classroom.

- URA's then receive real-time practice in classrooms alongside experienced COPUS users, before performing observations on their own.

*Training at the University of Kansas was developed using the training protocol from the Carl Weiman Science Initiative at University of British Columbia: http://www.cwsei.ubc.ca/resources/files/COPUS_Training_Protocol.pdf

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References

- Hora, Matthew T. and Joseph J. Ferrare. “Remeasuring Postsecondary Teaching: How Singular Categories of Instruction Obscure the Multiple dimensions of Classroom Practice.” *Journal of College Science Teaching* 43, 3 (2014): 36-41.
- Lund, T. J., Pilzarz, M., Velasco, J. B., Chakraverty, D., Rosploch, K., Undersander, M. & Stains, M. (2015). The best of both words: Building on the COPUS and RTOP observation protocols to easily and reliably measure various levels of reformed instructional practice. *CBE Life Sciences Education, 14,* 1-12.
- Smith, M. K, Jones, F. H. M, Gilbert, S. L, & Wieman, C. E. (2013). The Classroom Observation Protocol for Undergraduate STEM (COPUS): A new instrument to characterize university STEM classroom practices. *CBE—Life Sciences Education, 12 (4),* 618-627.

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