Department education specialist training workshop at Stanford University, summer 2017.

This six day workshop run by Carl Wieman will provide training for disciplinary experts (typically Ph.D.s) to become education specialists that work in departments to assist faculty in transforming their teaching. The model for these disciplinary education experts are the science education specialists used with great success in transforming teaching at the University of British Columbia and University of Colorado in their Science Education Initiatives. For more information see http://www.cwsei.ubc.ca/resources/STLF-develop.htm and other information on the CWSEI website.

As shown in detail on the following pages, this training program will replicate in six intensive days the training program developed and refined in the SEIs, which is also much the same as Carl Wieman's 10 week graduate course in science learning and teaching. Participants will be expected to complete the necessary reading (two relatively easy books and a few articles) before the workshop, and at the workshop they will discuss the readings, create and revise a set of 10 different activities for a course based on the ideas in the readings, and receive feedback from Wieman and other participants. By the end, they should be well-versed in the appropriate research on learning, and be prepared to create research-based instructional activities in courses based on this research. This will also prepare them to work with other instructors to design and implement such activities in a range of courses.

Anticipated participants will be 1) relatively new Ph. D. s with a strong interest in teaching who have been hired to work in a department to implement SEI type transformations of the teaching, and 2) long term lecturers who are to take on a similar role of working with other faculty to transform teaching throughout their department. If there is sufficient room and interest, tenure track faculty with an interest in working with other faculty to improve teaching will also be accepted.

The specific dates of the workshop will be determined by the preferences of potential attendees and availability of facilities and will be a Monday through Saturday some time between the last week of June and the end of August. The cost has not yet been set, but it will mostly be the cost of travel, room, and board in the Palo Alto area for participants.

Interested potential attendees, or departments who expect to be hiring potential attendees, should contact Rachel Knowles rknowles@stanford.edu, with an expression of interest, the anticipated number of people your department would like to send, and any constraints or preferences you have for workshop dates.

Workshop schedule. Participants would arrive having read How Learning Works and the ABCs of How We learn, plus a few articles to be specified. They also will be required to answer a standard set of reading questions on the reading of each unit.

Workshop desing and schedule

For each of the 9 units listed below there will be the following activities:

- Discuss reading—45 minutes
- Create activity (done individually, often night before or during lunch break) 2 hrs
- Discuss and modify activities in groups 1 hr + .5 hr presentations and Carl feedback
- After night sleep and reflection, refine activity and post (individual work) – 0.5 -1.0 hrs
- Review and critique posted activities 0.5 hrs

= 5.5 hours per unit. x 9 units = 50 hours. 6 days x 8.5 hrs per day.

	topics	**Reading**	**Tasks to be worked on in class-** individual write ups to be handed in later in week
#1	**Effect of prior knowledge**	• How Learning Works chapter 1 • extra: How People Learn chapter 1	Develop a list of instructional approaches and ways to probe student prior knowledge/ misconceptions that are particularly relevant to course you are taking/teaching.
#2	**Knowledge organization; expert novice differences**	• How Learning Works chapter 2 • (extra: How People Learn ch. 2)	**Pre-class task:** what are the important organizational structures relevant to course you are taking/teaching? Develop way to make important organizational structures explicit for the course. Create task that has learners explicitly analyze organizational structure of domain they are studying.
#3	**Motivation.** **a. General issues.** **b. social-psychological factors**	• How Learning Works chapter 3 • (Yeager et. al.: *Addressing achievement gaps with psychological interventions*[i] or *Social-Psychological Interventions in Education: They're Not Magic*[ii])	Apply strategies discussed in this chapter to enhance learner motivation in science course you are taking/teaching.

#4	**Learning and transfer**	• How Learning Works Chapter 4 • SEI 2-pager *Teaching Expert Thinking* • (extra: How People Learn ch. 3)	Create set of activities that will enhance and practice transfer; create tests that determine ability to transfer, both near and far in science course you are taking/teaching.
#5	**Deliberate practice including Formative assessment**	• How Learning Works Chapter 5 Ericsson: *The influence of experience and deliberate practice on the development of superior expert performance*[iii] Fortune Magazine *What it Takes to be Great*,[iv] Sci. Amer. *The Expert Mind*[v] • ABCs chapter • SEI 2-pager Assessments That Support Student Learning (extra: optional recommended: Talent is Over-rated, Colvin. Gibbs and Simpson: *Conditions Under Which Assessment Supports Students' Learning*)[vii]	Design a deliberate practice task for a topic in science course. Contrast this with a task that might be/is assigned and will take time but does not constitute deliberate practice. Include a number of ways to build in frequent formative assessments of specific aspects of the course you are taking/teaching (e.g. learning goals) – including a plan for getting feedback to students.

#6	**Learning goals**	• How Learning Works Appendix D: What Are Learning Objectives and How Can We Use Them? • Simon & Taylor: *What is the Value of Course-Specific Learning Goals?* • Smith & Perkins: *"At the end of my course, students should be able to..:"* • Mayer: *Rote Versus Meaningful Learning*[vi]	🎬Develop learning goals for a topic in a course you are taking/teaching. - or - 🎬Critique & improve some learning goals you already have. - and - 🎬From an exam (bring for course you are taking/teaching), evaluate the Bloom's level of some of the questions and create learning goals associated with these questions.
#7	**Development of self directed learners**	How Learning Works chapter 7: How Do Students Become Self-Directed Learners?	Pick a few strategies from this chapter & apply these to the science course you are taking/teaching.

#8	**Memory and retention Cognitive load**	• Bjork: *Memory and metamemory considerations in the training of human beings*[viii] • Karpicke & Roediger: *The Critical Importance of Retrieval for Learning*[ix] • Michelle D. Miller (2011): *What College Teachers Should Know About Memory: A Perspective,*[x] • Cognitive Load theory, on Wikipedia[xi] • Mayer et al.: *Increased Interestingness of Extraneous Details in a Multimedia Science Presentation Leads to Decreased Learning*[xii] possibly additional Wieman handout	• List practices in selected course that encourages study of the type that enhances retention. List practices in courses that hinder retention. Create modifications that would improve retention. Examine presentation in courses and find examples where unnecessary cognitive load. Create list of general ways to reduce cognitive load in presentations, apply to topic from your chosen course.
#9	**Peer Instruction and effective clicker use Group work: (beyond Peer Instruction) Different types, levels, benefits and tradeoffs of group activities**	• SEI clicker user's guide • (extra: Beatty: *Designing effective questions for classroom response system teaching*[xiii]) Watch: SEI video clips *How to Use Clickers Effectively* and *The Research: Do Clickers Help Students Learn?* • SEI 2-pagers: *Group Work in Educational Settings* and *Creating and implementing in-class activities; principles and practical tips* • (extra: Heller & Hollabaugh: *Teaching Problem Solving Through Cooperative Grouping. Part 2: designing problems & structuring groups*[xiv]) Watch: SEI video *Group Work in the College Classroom*	• Create or revise questions (either to be used with clickers or without), discuss how to facilitate in class, depending on outcome of vote. (Bring clicker or other discussion questions from the course you are teaching/taking if you have them – especially those you think need work) • Design a group activity for use in large lecture setting for science course you are taking/teaching. Contrast above with design that could be used in a smaller enrollment course or recitation section setting.

Full schedule of the 6 days. Likely will also be some social event(s) squeezed in.

Day 1	
9-9:30	Introductions, organize groups
9:30-10:15	Discuss reading #1
to 12:15	Create activity #1 (Work individually).
	Print out copies to share with group
12:15- 1:30	Groups critique activities. Working lunch
1:30-2:00	Present samples. Carl general feedback.
2-2:45	Discuss reading #2
2:45- 4:30	Create activity #2
4:30- 5:30	Groups critique activities.

evening & morning #2	Individual work.
	Review reading for units #3 and #4
	sleep
Day 2	
	Revise activity and post.
9-9:45	Discuss reading #3
9:45- 11:45	Create activity #3 (Work individually).
	Print out copies to share with group
12:00- 1:00	lunch
1:00-2:00	Groups critique activities.
2-2:45	Present samples. Carl general feedback.
2:45- 3:30	Discuss reading #4
3:30- evening	(work individually) Create activity #4 (~ 2 hours)
	Review reading for units #5 and #6
	Critique posted activities (~ 30 minutes)
	sleep
Day 3	
morning #3	Revise activity #3 and post
9:00-10:00	Groups critique activities. #4
10-10:30	Presentations and Carl general feedback
10:30-11:15	Discuss reading #5
11:15 -2:00	Lunch and create activity #5 (individual work)
2:00-3	Groups critique activities. #5
3-3:30	Presentations and Carl feedback
3:30-4:15	Discuss reading #6
Rest of day	Work individually. Create activity #6
	Critique posted activities
	Review reading units # 7 and #8
	sleep
Day 4	
	revise activity #5 and post
9:00-10	Groups critique activities. #6
10:30-11	Presentations and Carl feedback
11:00-11:45	Discuss reading #7
	Work individually. Create activity #7. lunch
2:30-3:30	Groups critique activities. #7
3:30-4:00	Presentations and Carl feedback
4:00-4:45	discuss reading #8
evening and morning next day	Work individually. Create activity #8 Critique posted activities

	Review reading units # 9 and #10
day 5	
10:00-11	Groups critique activities. #8
11-11:30	Presentations and Carl feedback
11:30-12:15	discuss reading #9
	lunch and create activity #9 (individual work)
2:30-3:30	Groups critique activities. #9
3:30-4:00	Presentations and Carl feedback
4:00-4:45	discuss reading #10
	Work individually. Create activity #9
	Critique posted activities
	Review reading units #10
	sleep
day 6	
10:00-11	Groups critique activities. #9
11-11:30	Presentations and Carl feedback
11:30-12:15	discuss reading #10
	lunch and create activity #10 (individual work)
2:30-3:30	Groups critique activities. #10
3:30-4:00	Presentations and Carl feedback
4-4:30	revise activity #10 and post
4:30-5:00	Critique posted activities
5:00-6:00	wrap up reflections and discussion. Concept mapping?