Supplemental Material

Szteinberg *et al.*

Peer leader Reflections on Promoting Discussion in Peer Group-Learning Sessions: Reflective and Practiced Advice through Collaborative Annual Peer-Advice Books

Supplemental Materials

These *Supplemental Materials* contain I) the syllabus (including the topics) for the training courses *Seminar in Academic Mentoring (SAM)*, and II) the coding guides for the three themes: Environment (Table S1), Group Dynamics (Table S2), and Facilitation (Table S3).

I. Topics and Syllabus for *Seminar in Academic Mentoring (SAM)*
1. **Topics in SAM include:** 1) learning how to effectively facilitate PLTL collaborative-learning strategies, including sample phrases for a chemistry PLTL session; 2) learning how to foster and maintain a growth mindset in students in an introductory science course; 3) discussing how to create inclusive learning environments, including discussions on social identity, stereotype threat, microaggressions, implicit bias, and academic social belonging; 4) reviewing cognitive research on learning and memory, retrieval practice, interleaving, and metacognition, as well as implementation strategies for addressing these concepts and evidence-based study strategies, for use in STEM courses; 5) discussing the stages of group dynamics and how to develop positive group dynamics over the semester of an introductory STEM course; and 6) examining and discussing implementation of the practiced advice for fostering discussion and collaborative knowledge building during problem-solving activities that comes directly from the SAM book used in the class.

2. **Syllabus**

Seminar on Academic Mentoring (SAM) Course
L43 (GS) 275-1 Credit (Credit/No Credit)
Section 1: Chemistry

Instructors:

Course Description and Goals:
The objective of the SAM course is to guide first-time peer leaders and mentors in developing general pedagogical knowledge of group dynamics, leadership and facilitation skills, and effective communication and listening skills. SAM meets once a week and first-

time peer leaders and mentors from Chemistry learn about the theoretical rationale of the PLTL model and how to facilitate a student-centered session, which guides students to discover the solution rather than telling students the answers, fosters collaborative student interactions, and actively engages all students.

Course Grades:

1. 2 reflections, 5 responses, 1 self-evaluation, and Discussion Board posts (45%)
2. 1 group project (30%)
3. Participation in class, including Discussion Board posts (25%)

The course is credit/no credit. To receive credit, a student must have accumulated at least 70 points (out of 100 points), must participate in class, complete every assignment, and may have no more than 1 absence, which must be excused.

Participation in Class:

No more than one absence is allowed, and it must be excused. Active participation during group discussion is required. Group discussion in class will be guided by your posts on the course Discussion Boards on Blackboard (see instructions below).

Clickers

In this course, we will be using i>clicker technology during every class. Each student will need to check out an i>clicker from Olin Library in order to participate (and to have your participation recorded). Therefore, before September 2, please go to the Olin Library Help desk to check out an i>clicker. These devices are available for checkout only for students registered in specific courses, so please be prepared to tell the circulation staff that you are registered for this course. Return your i>clicker to the library after classes end and before December 19. Students who do not return their i>clickers at the conclusion of the semester will be charged for replacement of the device.

<u>**Assignments**</u>

Discussion Board Posts:

Group discussion in class will be guided by your posts on the course Discussion Boards on Blackboard. You are required to post a thread in the Discussion Board three (3) scheduled times during the semester, but you may post more often if you like. Your post should be a short paragraph describing an issue that occurred or something that went exceptionally well during your most recent PLTL or mentoring session. Please do not use student names in your post. You are also required to read the posts on the Discussion Board each week and reply to one of the posts, based on the course schedule. *Discussion Board posts are due by 11:59 p.m. on Mondays, and Discussion Board responses are due by 11:59 p.m. on Thursdays (see schedule of assignments).*

Response Assignment: (see instructions on Blackboard)

Write a response paper responding to the essays written by the new peer leaders from last year. You must read and reflect on **at least 3 of the papers** in the assigned reading section(s). A list of topics can be found in the Summary of Assignment Due Dates. The response paper must be submitted to the Blackboard Assignment by **11:59 p.m. on the day it is due**.

Each entry will be graded on a 5-point scale according to the following criteria:

- Provides clear evidence that at least 3 papers were read and reflected upon from the assigned reading. (For example, the author provides direct quotes and citations, or paraphrases and cites papers from the assigned reading.) (2 points)
- Provides examples of how the papers in the assigned reading can be used to prepare for PLTL or mentor sessions or be applied during a session. (1 point)
- Makes connections between the papers in the assigned reading and the content covered in the SAM course. (1 point)
- Is logical, includes clear arrangement of ideas, develops ideas through supporting details and evidence, and is free of grammatical errors. (1 point)

Reflection Assignment: (see instructions on Blackboard)

There are 5 opportunities to submit a reflection, 2 reflections are required. The reflections are to be written after the weekly SAM session and PLTL or mentor session. Reflections must be submitted as an Assignment on Blackboard by **11:59 p.m. on the Monday following the PLTL or mentoring session. The reflection must be on the most recent workshop.**

Each entry will be graded on a 5-point scale according to the following criteria:

- Includes specific examples from your group that are related to the topic that was just covered in the SAM course. (2 pts)
- Identifies either issues or difficulties that are currently occurring in your group, or areas of growth, development of group dynamics, and the ability of your group members to work together. (1 pt)
- Provides solutions for issues occurring in the group or insights to improve the group's ability to work together. (1 pt)
- Is logical, includes clear arrangement of ideas, develops ideas through supporting details and evidence, and is free of grammatical errors. (1 pt)

Self-evaluation as peer leader or mentor: (see instructions on Blackboard)

The self-evaluation should focus on how the peer leader or mentor perceives his or her strengths and weaknesses as a peer leader or mentor and should contain suggestions that he or she plans to use to improve as a peer leader or mentor next semester. The self-evaluation must be submitted as an Assignment on Blackboard on **Monday, December 1 by 11:59 p.m.**

Group Project: **(see instructions on Blackboard)**

As a group, you will discuss what you have learned this semester as peer leaders or mentors, and create a collection of essays about what you have learned. The group will pick topics to cluster the essays around, and will pick a title. The collection will be bound and given to next year's new PLTL peer leaders and mentors.

Grading of group project (Take sum of each grading section):
- *Title* (2 points)
- *Group dynamics during discussion* – instructors' evaluation (13 points)
- *Essays* – graded according to grading criteria for papers, and agreement with the group philosophy for the book (15 points)

Submit your paper via Blackboard by **Thursday, December 18 at 5 pm**. Please use the filename – "SAMGroupProject_your last name."

Summary of Assignment Due Dates

Due Date	Assignment
Mon 9/8	Discussion Board posts due, Group A; Response #1 Due, Section 1: May Your Group Be Ever in Your Favor
Thurs 9/11	Discussion Board responses due, Group C
Mon 9/15	Discussion Board posts due, Group B; Response 2 Due, Section 2: Training for the Arena
Thurs 9/18	Discussion Board responses due, Group A
Mon 9/22	Discussion Board posts due, Group C; May submit Reflection #1 (must submit today or 9/29)
Thurs 9/25	Discussion Board responses due, Group B
Mon 9/29	Discussion Board posts due, Group A; May submit Reflection#1 (must submit today or 9/22)
Thurs 10/2	Discussion Board responses due, Group C
Mon 10/6	Discussion Board posts due, Group B; Response #3 Due, Section 3: PLTL 13: There's Nobody Here
Thurs 10/9	Discussion Board responses due, Group A

Mon 10/13	Discussion Board posts due, Group C; Response #4 Due, Section 4: I Volunteer As Scribe!
Thurs 10/16	Discussion Board responses due, Group B
Mon 10/20	Discussion Board posts due, Group A; May Submit Reflection
Thurs 10/23	Discussion Board responses due, Group C
Mon 10/27	Discussion Board posts due, Group B; Response #5 Due, Section 5: The Student On Fire
Thurs 10/30	Discussion Board responses due, Group A
Mon 11/3	Discussion Board posts due, Group C; Last Opportunity to Submit Reflection
Thurs 11/6	Discussion Board responses due, Group B
Mon 12/1	Self-Evaluation Due
Thurs 12/18	Final Project Due. Submit to Blackboard **by 5 pm**.

Ethics

Evidence of cheating or attempted cheating will be forwarded to the Committee for Student Academic Integrity. Students found guilty by the Committee will be given a grade of F for the course. In addition, they will be referred to the Dean for further disciplinary action. Please refer to the "Statement of Student Academic Integrity" on page vi in the Course Listings or on the website at:
(URL: https://acadinfo.wustl.edu/WUCRSLFrontMatter/WebWUCRSLInfo_AcadIntegrity.htm).

Disclaimer

The instructors reserve the right to make modifications to this information throughout the semester.

II. Coding Guides for the three themes: Environment, Group Dynamics, and Facilitation

1. Table S1: Coding Guide for the Environment Theme

2. Table S2: Coding Guide for the Group Dynamics Theme

3. Table S3: Coding Guide for the Facilitation Theme

Table S1: Coding guide for the Environment theme

Research Question: What do peer leaders report they do to create and maintain a conducive environment for effective problem-solving discussions in collaborative groups?

Theme	Category	Sub-Category	Description or Sample Statements
E	**Leader Attitude (LA)** Importance of presenting a positive and professional leader persona	**Show positivity (P)**	*"Also, try to keep a positive attitude. By this, I don't mean you should be as bubbly as you can be all the time, because that's just annoying. Just be encouraging and sympathetic if the students seem to be having a hard time. Be genuine and show the students that you actually want to be at PLTL, and sooner or later, even the most difficult students will warm up to you and appreciate your sincerity."*
		Prepare for session (SP)	*"If they start to notice that the leader is not prepared to guide the group, they will start wanting to take short cuts in the problem set and be less willing to make sure they understand the problems instead of just finding an answer as quickly as possible."*
		Display professionalism (PF)	*"As time progresses, the leader should continue to be sociable to students but remember to maintain a certain level of authority so that students will respect the leader and take every session seriously."*
		Show confidence (C)	*"First, be confident in yourself! I'm sure it seems like PLTL leaders just show up at their sessions ready to go and everything just magically runs smoothly."*
	Social Environment (SE) How to develop and maintain a social environment and a sense of community among students	**Develop community (DC)**	Icebreakers *"The ice-breaker from the beginning of the year might not have been enough to actually break the ice; allow students to talk about other things, unrelated to PLTL, so that they get comfortable with each other. You will have to sacrifice problem-solving time, but it is worth it in the long run."* Student/student social interactions *"Enhancing the more social aspects of the group creates a more comfortable environment for the group to work, and also plays a key role in improving the*

			communication between the group members and with the leader."
		Communicate with students (CS)	Email correspondence between sessions, before sessions *"E-mail your group, tell them where you are meeting, and when."*
		Know your students (KS)	Leader/student social interactions *"I often ask my students how their weekend has been so far. This helps create a more social atmosphere where the students are comfortable around the peer leader and with each other."*
	Physical Environment (PE) How to create a relaxed environment	**Bring food (BF)**	*"Beyond helping with your group's dynamic, food can potentially start to establish you as a positive figure rather than a not-so-positive one."* *"And if they are getting tired and restless while doing the problem set, bring them food or candy treats to keep them energetic and reward them for paying attention—sugar is a great motivator."*
		Arrange space (AS)	*"As you have probably already heard, you should rearrange the tables and chairs that would be most convenient for your students to see the board and to interact with one another. I would suggest a square or circle. If your room has windows that face the swamp, be prepared for your students to be constantly distracted."*
	Group Expectations (Ex) How to explain the PLTL philosophy, set ground rules for sessions, and set expectations for students	**Introduce philosophy (IP)**	First day *"As with most things PLTL, one of the most important ways to get your students on board with the collaborative learning strategies is to set up expectations in regards to the use of these strategies from the very first session."* Leader role *"Also, be sure to go over the PLTL Philosophy with them in detail. My group and I read it popcorn style to make sure that each student understood what PLTL is about as well as what the role of the leader is."* Gain "buy-in"

| | | | *"I found it especially useful to remind students that these rules will help them to get the most benefit out of PLTL, which is the reason they enrolled in the first place."*
Remind
"The next time that the students finish a problem and you feel eight pairs of eyes staring at you (or not, depending on how good your attendance is on that day) look right back at them and just shrug your shoulders. They may be slightly confused at first, but remind them that you won't be there standing over their shoulder when they are taking the exam, so why should you tell them the answer now?" |
| | | **Establish ground rules (GR)** | *"After they understand the Philosophy, they should make some rules of their own (be on time, listen to everyone's ideas, etc). These should come pretty easy to them, but be ready with some basic ideas just in case. The more specific your group is with these rules- the smoother things will go in the long run."* |

Table S2: Coding guide for the Group Dynamics theme

Research Question: What do peer leaders report they do to manage group dynamics such that all members of the PLTL group participate, including managing different student personalities and maintaining healthy group dynamics?

Theme	Category	Sub-Category	Description or Sample Statements
GD	**Group Functioning (GF)** How to ensure productive group functioning to maximize the learning from positive group dynamics	**Use strategic grouping (SG)**	*"In pairs, I found it's best not to pair the quietest and the loudest right away—allow things to normalize a bit over a session or two, then try putting them together. The dominant students usually realize after a little while that the rest of the group has worthwhile things to say, and that you're not going to let them walk all over the rest of the group, and soon will talk less."* *"Small-group problems tend to be the most popular among students. In order for this strategy to be effective, the groups need to be mixed up after each small-group problem. If the same students work together each time, they will not be able to see any other methods of solving the problem that the students in other groups may have come up with."* *"Pairs can be particularly useful to bring people together who otherwise have not really hit it off, or to separate two people who have hit it off too much and won't focus."*
		Actively Monitor (AM) Carefully monitor sessions to modify aspects and maximize group efficacy	*"Paying attention to the dynamic in each group helps you profoundly in the second stage of this CLS: reporting. Having the knowledge of who was more dominant in the small group discussion, you could assign the quieter student to put what they have come up on the board and ask him or her to explain why they did it."* *"Don't be afraid to monitor the discussion, especially when the conversation is only between a few students. As the facilitator, it is your job to keep the dominant students in check."*

			"Watch each group carefully and encourage discussion when necessary"
		Remind about philosophy (RP) Remind and reinforce group learning philosophy	*"Feel free to remind your students, even if it's already the middle of the semester, of the "rules" for scribe (and any other collaborative learning strategy for that matter), especially that the scribe is not supposed to contribute at all"* *"If any student becomes a regular problem, you may have to make the difficult decision of talking to them privately about their actions and their participation in the group."* *"You must set a stringent set of rules during all of the group-collaborative learning strategies and make sure the dominant students follow the strategies."*
	Balancing Personalities (BP) How to manage different student personalities - dominant, quiet, disruptive, etc. to ensure balanced contributions from group members	**Rein in dominant students (DS)** How to manage students who tend to dominate group discussions	*"It is important as a PLTL leader to ensure that there is balanced discussion and sometimes this requires reining in the dominant student. An easy way to do this is by making the dominant student scribe"*
		Encourage quiet students (QS) How to encourage participation from quiet or shy students	*"you can ask the quieter student to explain the group's reasoning or problem solving technique, and if that student can't explain it, you can ask the other students in the group to explain the concept to him"* *"If the quiet student in your group still doesn't participate in group discussions, talk to him/her in private. Explain to the student that the more he/she participates the more he/she learns and that PLTL is all about working with others. Try to find a way to help the student as much as you can and do not give up until you succeed."*

			"For shy students, I find using the problem solving techniques to your advantage to be the best strategy."
		Strategically pair students (SPS) Pair student personalities to balance participation; also includes assigning particular roles to certain personality types within a pair	*"If you were to assign the role of leader to the quiet person or put them in a pair with another quiet person they would get an opportunity to gain valuable experience and confidence conveying their thoughts to another person."* *"Try pairing the dominant students together because this will allow for very long discussions between themselves and interesting ideas that will be shared once all the small groups come together"* *"Pairing a dominant student with a quieter one could be a good idea because the smaller group may be a better environment for the quieter student to ask questions, and it forces the dominant student to slow down and explain the steps"*
	Promoting Equal Participation (PEP) How to encourage equal participation from students	**Call on students (CS)**	*"If you notice students who are trying to blend into the background, it is a good idea to call on them for an opinion or an answer"*
		Use turn-taking (TT)	*"For the round-robin method, it is important that each student gets a chance to contribute. If the round-robin question does not have enough components, you can ask follow-up questions to the remaining students or let those students answer the next round-robin question first."* *"Another possibility is to go in a circle and have each person add something to the chalk board so the group solves the problem on the board one at a time (great for more visual problems)"*
		Get students talking (GT)	*"Be friendly, encourage participation from all members, get students talking to each other,*

			and make some jokes in order to keep the students engaged and stress-free."

Table S3: Coding guide for the Facilitation theme

Research Question: What do peer leaders report they do to effectively facilitate groups to encourage group learning and collaborative knowledge building across different types of problems, skills, and content?

Theme	Category	Sub-Category	Description or Sample Statements
F	**Pacing Sessions (PS)** How to pace sessions in a way that keeps students engaged, moving forward, and together	**Move together (MT)** PL uses pacing to keep group moving through problems together, taking into account different student pacing concerns	*"Sometimes they would get intimidated by the more advanced students in the group and tell me they were ready to move on before they really grasped the material. They're tricky like that. But don't let them fool you. Ask them questions about the subject matter until it's clear that they do get it. Break through that hard outer shell and you'll see that they're all there to learn and they want your help. "* *"I've found that a good tactic to help the group stay cohesive is to have the problem read out loud and then to force all of the group members to sit and think about the problem for about 30 seconds before they go off into pairs, small groups, or round robin."*
		Take breaks (TB) PL initiates breaks when beneficial for groups	*"If your group gets frustrated, do not be afraid to break from the problem set. After all, two hours can be a long time if your group is just working the whole time."*
		Move Forward (MF) PL works to push groups forward when they are stuck or lingering too long on one problem	*"Then again, occasionally, everyone is talking and trying, but they just are not able to get through the problem – no matter how many helpful questions you ask. There are two main reasons for this. First of all, they might need to switch up the problem-solving strategy, for instance if a problem you start as a round-robin turns out to require everyone's input to solve."*
		Get back on track (GBT)	*"In general, it is good for the group members to be friendly and talk to one another, but this can become a problem when it is difficult for the*

		PL gets students back on task when they veer too far from problem topic, either with social talk or other distractions	*leader to get the students back on track to the problem set after a couple of minutes of socializing. If this starts to happen, the leader needs to be strict with the disruptive group member at that time. Another strategy is to remind the group as a whole that if the talk continues, they might not finish all the problems within the allotted two hours."*
		Use wait time (WT) PL gives students time to think on their own or pauses when asking questions	*"Make sure you let them process the problem before you put them on the spot"* *"Once the session starts, make sure students are given plenty of time to think critically and apply lecture concepts to new situations. This, ultimately, is college-level thinking, and what the students will be asked to do on exam day."*
	Questioning Strategically (SQ) How to make strategic use of questions as a tool to keep students moving ahead, think independently, and generate their own discussions	**Use redirection (Re)** PL uses questions to deflect student questions and put them back to the group	*"Initially, the students will constantly look to you for answers and will want you to explain anything they even have the slightest confusion about. In order to diffuse this pressure to be "perfect," encourage students to ask each other what they think and to come to a consensus."* *"Every time a group member looks at you, be ready to deflect the question. Here are some responses you can use. If the group does not know how to start, tell them to, "Take a look at your notes," or ask, "Has your professor done a similar problem in class. Remind them that your job is not to answer these questions—they should address their group members."*
		Guide via questions (GQ) PL uses questions to help guide group in a fruitful direction	*"Asking different students questions that guide them towards how to approach and solve the PLTL problems is a powerful way to make students more willing to voluntarily answer questions and lead the group."* *"Only step in and ask a question if you think: (a) the concept is something important, (b) that it is something that a lot of the members are*

			probably confused about, and (c) that one of the other group members won't correct it."
		Encourage student explanations (SEx) PL uses questions to prompt students to provide explanations, underlying concepts, or thought processes to other group members	*"Or, if one student doesn't understand what was done, ask another student to explain."* *"Through leading questions you can encourage students to think about the material on a deeper and more comprehensive level."*
Motivating Student Learning (MS) How to keep students motivated and working towards PLTL goals	**Promote preparation (PP)** PL reminds students to prepare adequately for sessions to get the most out of learning opportunity	*"To prevent students from showing up unorganized, send them an email reminder before the weekend to review their notes and do the problem sets before the session."* *"Remind them that the PLTL questions are guaranteed not to be on the exam, but the concepts and principles behind the problems are sure to appear on the test. This will make them more willing to discuss concepts."*	
		Provide incentives (PI) PL motivates students to maintain focus and engagement in group learning	*"By switching up PLTL and working in a different order, bringing homemade treats one week and just candy the next, or by providing some sort of incentive such as extra problems or models to aid in explanation, the students in your group never know what to expect or if they are missing out on something."* *"For example, you may choose to preface an upcoming problem by saying something along the lines of, "I've actually seen something like this on a couple of practice tests from the past couple of years," or mention "You probably want to know how to do this for the test next week." This tactic will give the students an*

			incentive to be attentive and involved in the group problem-solving process."
	Structuring Sessions (SS) How to organize PLTL sessions in order to maximize efficiency and keep students thinking critically	**Add variety (V)** PL changes up session structure or approach to avoid set routines and experiment with different strategies	*"The first strategy to reinvigorate a PLTL group, especially once the most recent rounds of midterms are over, is to try new routines. Reinvent ways to approach problems and experiment with different styles. "* *"Variation is another important aspect of PLTL. As much as we love those tried and true favorite meals, eating the same thing day after day becomes boring and unsatisfying. By switching up PLTL and working in a different order, bringing homemade treats one week and just candy the next, or by providing some sort of incentive such as extra problems or models to aid in explanation, the students in your group never know what to expect or if they are missing out on something."*
		Vary working order (WO) PL strategically varies order of problem set or steps	*"Instead of following the numerical listing of the problem set, start from the last problem. It never fails to surprise students, especially if you regroup the problems according to level of difficulty so that they feel accomplished once they solve the simplest problem on their own, resulting in a greater interest in the problems to follow."* *"Break it into very small parts, and make sure every step is explained."*
		Review material (MR) PL reviews prior material or has students engage in review exercises	*"Often, a thorough review of the past week's material constructed prior to working through the problem set is enough to answer most questions. If the review is written on the side of the board, you will be able to quickly refer your group to it."* *"Encourage them (tell them) to briefly review last week's concepts before diving into this week's problem set so they at least refresh their memory"* *"Have the group members look through the book for similar problems, and look up the answers to the questions they are asking. Also have them look at notes from the previous week, and*

			encourage them to discuss main topics they have learned."
	Promoting Group Independence (GI)	**Allow student struggle (St)** PL allows students to engage in some productive struggle before moving on	*"I have found it effective to allow a group to struggle with a problem on their own, but intervene before frustration overwhelms them. At this moment I'll ask a few questions, throw out ideas, and try to reenergize a failing discussion and put them back on track."* *"Realize that letting your students struggle through a problem and walking out with only half of their questions answered can be a good thing. Education, especially at Wash U, is about critical thinking."*
		Encourage self-reliance (Sr) PL tries to encourage students to rely on what they know or can find out on their own first	*"Have the group members look through the book for similar problems, and look up the answers to the questions they are asking. Also have them look at notes from the previous week, and encourage them to discuss main topics they have learned. This may spark some understanding and enable students to make connections and begin the problem. By reviewing main topics and strategies, the group may see what skills the problem requires, and thus see how to approach it."* *"Many times, questions are simple like constants or some other factoid that can easily be found in their notes. It might seem harmless to tell them the speed of light, but it's good to force them to use their notes. Their notes are a valuable resource and learning to use them and refer to them will teach them a priceless skill that will serve them well throughout the rest of their time in school."*