PEER-LED TEAM LEARNING
LEADER TRAINING

TWENTY WORKSHOP TECHNIQUES

DAN PARKER, CATHY HARGIS, AMBER KRUMMEL, STACIA WEAVER,
BRIAN YATES, AND ELINA YUSUFOVA

Workshop sessions are developed with the idea that there are different learning styles and that these learning styles can be accommodated using different facilitation techniques. This article provides examples of techniques to use for a variety of situations. Additional tools that a leader might use when deploying these techniques are computer modeling, analogies with concrete objects, the blackboard, online links, as well as other tools.

Note: The smiley faces **:-)** *used below are meant to represent the level of complexity that the group should be able to handle in order for the leader to incorporate the technique. One* **:-)** *should be used with the group that has just been started. Four* **:-) :-) :-) :-)** *should be used with those groups that work well together.*

1. Postmortem Summary **:-)**

Idea: When your students give you an answer it is beneficial to have them summarize their thinking process. By summarizing the process, the students are forced to organize their thoughts and review their process. Additionally, other group members may benefit from the explanation, and the leader can help fill in gaps.

Tips: This idea works well with students who generally try to rush through the workshop, because it forces them to slow down. It may also be useful with quiet groups to increase participation.

Potential pitfalls: If a student does not understand the problem, she/he, in summarizing may feel embarrassed, or the rest of the group may end up confused. You may want to model the process by reviewing the steps the group went through to solve a problem. Or, you may want to prepare the student by asking her/him to write out the sequence of the process before explaining in order to minimize confusion.

Example: When reviewing the self-test for your workshop, don't just settle for the answer. Ask your students to explain the process they used. If the question is more conceptual, be sure to require more than a textbook definition from the students. It is also a good idea to ask them to paraphrase the meaning and provide real world examples.

2. Asking general questions **:-)**

Idea: Ask the student or group a more general question.

The idea is to ask a question not specifically related to the problem being attempted. Asking a more general question should spark new ideas or a sense of direction while attacking the problem.

Tips: The question may have a guiding point, e.g., the answer may allude to a reference point from which to begin, or relate a process that may be applied. This is a useful strategy to prompt students to consider relevant concepts and to promote productive interactions among students.

Potential pitfalls: Students may not understand the point of your question. When the students have solved the problem, relate it back to the question that was posed so that the group can see the connection. This builds confidence in the leader as well as a deeper understanding of the material.

Examples: Schoenfeld (1985): "What are you doing?", "Why are you doing it?", "Where do you think it will get you?" King (1992): "What do we already know about … .?"; "What is the difference between … and … ?"; "Are there other possible approaches?"

3. Redirecting questions **:-)**
Idea: Use steering techniques to prompt the workshop in productive directions. Make the students re-evaluate what it is they are asking, and provide "just enough" guidance to nudge them in the right direction. Push them to answer the question among themselves as a group.
Tips: This technique is very effective in expanding the ceiling of group dynamics. By pushing the students to achieve it on their own you effectively "challenge" them to solve it as a group.
Potential pitfalls: Students may be upset or frustrated that you are asking a question in response to their question, or the lack of problem-solving progress. Avoid mistakes such as "dodging" questions or leading too much. Find a balance and stick with it.
Example: Student: asks question about problem.
Leader: "That's a good question. What do you think?" Or, leader replies with a question that forces student or group to evaluate what they are asking and why.

4. Waiting on a response **:-)**
Idea Give students time to respond to workshop problem or posed question (general or redirected).
Tips: You need to give students time to think about the answer. Don't just jump to another student who has the answer more quickly than the others. If you want students to give quality responses, you need to give them time to think and evaluate information.
Potential pitfalls: If the student does not answer after some reasonable waiting time (at least 30 seconds) you can:

- Ask leading questions
- Ask others to help out

Don't embarrass students with unbearable wait times.
Example: Wait time is situational. The minimum amount of time should be 30 seconds, and can be extended to minutes, as appropriate. You might inform the group at the initial meeting that you will allow wait time whenever a student is asked a question.

5. Focus on the process **:-)**
Idea: Students estimate the answer, rather than using a calculator.
This will give them a better sense of the qualitative process. Because students have to do the math for the exam, they will need to know how to do the calculation. However, allowing them to estimate first will provide them with the knowledge of whether their answer is reasonable.
Tips: Do not get hung up on the math; concentrate on the concepts and how to solve the problems rather than numbers. You might possibly make known constants ambiguous in order to qualify the answers, but be sure to let them know what you are doing, so they do not get known values wrong on the test.
Potential pitfalls: Sometimes students get intimidated by the math on the exam or they want to get some final product and it irritates them, so you need to vary your approach, sometimes focusing on the problem (in the beginning of workshop) and then toward the end of that section, focus on all aspects of the problem, including the calculations.

6. Giving hints **:-)**
Idea: If your students are really stumped and cannot even start a problem you may want to give them a hint concerning the type of problem, or refer them to an earlier, similar problem. Or, help them discern what they are solving for and then "guide" them to the correct process. If these ideas do not work, you may want to help them set up the first step.
Tips: This idea works well with students who are really struggling or stuck at one point. It allows them to still solve most of the problem even when they may have been stumped at the start.
Potential pitfalls: If you use this approach too often your workshop students may become too dependent on you. Make sure to allow plenty of time for the students to figure out the problem and intervene as a last resort.

7. The artistic approach **:-)**
Idea: You may ask the group or an individual to go to the board and illustrate what they think is going on in the problem. The group, as a whole, can sit back and discuss their thoughts and may even revise the original artistry.
Tips: It is always helpful to visualize what is going on beyond the numbers and equations. All groups benefit from a visual interpretation. The Internet is also a great resource to find alternative ways of presenting scientific content (e.g., plays about electrophilic addition, songs like "Grignard, the Beautiful" set to "America, the Beautiful").
Potential pitfalls: One possible pitfall would be a misrepresentation of the information. An adept leader or group should be able to catch any blatant flaws and direct the discussion productively.
Example: Most physics problems involve a picture of what is going on. A classic lever problem is easier to see with a cartoon of the lever itself, including a representative analysis of forces and distances.

8. Moving on when not everyone understands **:-)**
Idea: If the workshop is running long or some students are repeatedly holding up the group (despite efforts by the leader and/or students to explain), the leader may need to make the decision to move on. Encourage everyone to review on their own and bring any questions the following week or to available resources (e.g., office hours).
Tips: This should only be used with students who are extremely unprepared or are behind in class. Hopefully, these students will recognize their responsibility to the group work.
In private, let the students know what other resources are available to them, e.g., tutoring, consultation with the professor, lab, textbook, online resources such as tutorials.
Potential pitfalls: This may offend a student so you will need to be polite. Another solution is usually to ask other students to explain because often there are other different ways to solve or explain problems: visual, modeling, relating to life, making analogies, or graphic organizers.

9. Know your resources **:-)**
Idea: Find workshop materials and themes while utilizing a variety of techniques. Use a broad base of ideas and styles in your groups, gathering resources from all available providers. Such resources can include other texts, other professors, other students, their labs, and different classes.
Tips: Be sure to avoid using one style of learning technique. Always maintain diversity in forming your base of activities. Do not become stagnant! Constantly strive to incorporate new ideas and topics.
Example: Finding resources:

- ✓ Push for online support: High speed sharing, instant updates, feedback, etc.

- ✓ Search out new contacts! PLTL is nationwide - don't forget!
- ✓ Take existing resources and adapt them to suit your workshop.

10. Small group/Large group **:-) :-)**
Idea: Students work in groups of two or three on an assigned problem(s) and then present their work to the whole group.
Tips: The whole group is split into two or more smaller groups. This promotes student participation. Time is of the essence. Give the small groups a time limit to finish the problem.
Potential pitfalls: Be sure the small groups are truly working together and not relying on one person to solve the problem. This is taken care of by meandering among the small groups.

11. Jigsaw **:-) :-)**
(Note: Modification of the cooperative technique developed by Aronson, 1978.)
Idea: Split the workshop into smaller groups. Each group is assigned a problem. When all groups have completed their problem, they switch group members. Members in the new group now explain their problems to each other (see example below).
Tips: Promotes student-student interaction. Everyone has to work together to understand the problem. Gives individuals practice articulating and explaining their understanding.
Potential pitfalls: This tactic may be hard for quiet and shy people. You may want to pair such students with another quiet person who will not take control. It also works to pair them with someone who will make them explain it and not dominate the interaction. To prevent the "telephone" effect, the leader needs to monitor the discussions and make sure the explanations are clear and correct.
Example: Form three groups of three students. Each group is assigned one problem. One person from each group moves, combining to form a new group, and each new member explains the problem-solving process for their problem.

12. Round Robin **:-) :-)**
Idea: The group works as a whole with each member going to the blackboard, responsible for one step of the problem. The group must reach consensus that the proposed step is appropriate before continuing. Roles can be switched in subsequent problems.
Tips: Helps break down a problem into more manageable chunks. Students can acquire practice with smaller steps and see how it fits into the overall process.
Potential pitfalls: Watch out for controlling students taking over at the board. This is not a problem if the leader is active in prodding people to take their turn at the board. For students who are stuck at the board, remind them that the whole group is a resource for them.
Example: This tactic works well for long "marathon" problems with an overwhelming amount of information. Incorporate "what we know" technique and graphic organizers.

13. "Tell me what to write," or act as scribe **:-) :-) :-)**
Idea: Have one individual (student or leader) go to the board and the group simply tells the person what to write.
Tips: Good strategy if the group is too leader-dependent or needs to engage students who are not prepared or are struggling. This is good to use after a few weeks when the group knows it is OK not to have understood the problem initially.

Potential pitfalls: Initially enticing a student to come to the board may be difficult. Assure the student that the group will be responsible for ideas, and he or she just has to scribe.
Example: Good problems for this tactic will require several steps such as balancing redox reactions, solving vertical incline problems in physics, or genetic pedigrees in biology.

14. "M&M" approach **:-) :-) :-)**
Idea: At the beginning of the workshop, leader passes out 2-4 M&M's to each member. Each M&M represents one comment or question. Once a person has used up his/her allotment of M&M's, he or she must stay quiet until everyone has used up his/her M&M's.
Tips: This strategy is designed to encourage whole-group participation and discourage dominating personalities. Chocolate (or, food in general) always helps lighten the mood.
Potential pitfalls: Strategy may backfire if used for a problem that is too difficult for everyone to contribute ideas, so the leader needs to choose problems that are accessible and generate discussion. Also, make sure the M&M's aren't eaten before students contribute to the discussion.

15. Let them "screw up" **:-) :-) :-)**
Idea: Mistakes can be a great opportunity for learning. While the students are solving the problems, do not be afraid to let them screw up. Many times they will catch their mistake by the end. If they don't, rather than just correcting them, ask them to explain their answer and ask them if their answer makes sense.
Tips: This idea will be most successful with groups that are comfortable with one another. It also requires you, the leader, to have earned their trust. You don't want them to think that you just don't care whether they understand or not.
Potential pitfalls: Unfortunately, your students may not catch their mistakes, even after you ask them to explain and review their answer. If this happens, try to figure out where they went wrong and point out this area. Ask questions so that they can figure out their own mistakes. Some students may be discouraged or may feel embarrassed. For this reason, it is suggested that you make sure your group feels comfortable and supported before trying this.

16. "Pass the beanie baby" **:-) :-) :-)**
Idea: Working as a large group, only the person with the "beanie baby" (or other item to pass) is allowed to speak.
Tips: This strategy is designed to encourage participation and listening while discouraging people from talking over one another.
Potential pitfalls: For students who are not comfortable speaking, give them the option to pass the "beanie baby" on to someone else.

17. "Ask me one question, and I'll tell you no lies" **:-) :-) :-)**
Idea: The leader has the group working in groups of three or more. Each group is allowed to ask the leader only one question or ask for one hint for the assigned problem.
Tips: Useful strategy when students rely on the leader too much for hints and direction. Promotes student-student interaction as they solve the problem and also as they generate their one question.
Potential pitfalls: Leader needs to be aware of the capability of students and level of difficulty of the problem. If the problem is too difficult, the group will not be able to solve the problem even after asking one question.

18. "Take a load off" **:-) :-) :-) :-)**
Idea: Although you should spend a majority of the time in the workshop, it may be advantageous for you to take a 5-10 minute break. Simply tell the group you are going to get some coffee and start them on one or two problems that they should be working on in your absence.
Tips: The idea is that the students lose their "safety net." This makes them rely on each other for their answers. It also instills a sense of freedom and eliminates the overseer. This helps the group members depend on themselves rather than the leader.
Potential pitfalls: The students may feel stranded in a less advanced sense of community. Similarly, if the group is totally lost, they may not be able to effectively begin the problem. Being able to read your group should alleviate this problem. If you sense that they may not know how to get started, get them started before you leave.

19. "Top 10 list" **:-) :-) :-) :-)**
Idea: At the end of the workshop or the end of a chapter, students generate a list of important concepts.
Tips: Good review technique to prompt students to reflect back on and articulate important ideas.
Potential pitfalls: Individual workshops may be more conducive to a "postmortem" wrap-up rather than a "Top 10 list."
Example: In organic chemistry, generate list of "Top 10 reactions."

20. Flowcharting (& other visual organizers) **:-) :-) :-) :-)**
Idea: A flowchart (as well as other types of charts and graphic organizers) can be used successfully both by individuals and by groups in order to break down complex problems. The first thing that a flowchart helps students with is defining the problem and sorting the material given: what is the goal, what is needed to find the goal, and what information is already known? Once the students have figured out what the problem is asking for, they can move on to thinking about the solution, and breaking down the solution into simpler steps. When the steps have been written out and the problem solved, the students need to verify the solution and reflect on it. This is where discussion comes into play, and students can voice their opinions about the problem, and talk about the process as well as the outcome.
Tips: A flowchart is great for problems that are complex and can be broken up into steps. Flowcharts and other visual organizers (such as concept maps) are excellent promoters of group work. Flowcharts can be used in conjunction with the Round Robin method, especially when used for the first time.
Potential pitfalls: Two main things that a workshop leader needs to be aware of: 1) the time that it takes to show the students how to build and use flowcharts successfully, and the types of problems that flowcharts can be used with "process problems," numerical problems that require some steps to get to the answer. Building good flowcharts comes from experience, so students cannot be expected to be able to build great flowcharts the first time they do it. It requires time and workshop leaders' help. Though it is definitely worth the effort for long complex problems, other more efficient methods can be used with simple short problems. For conceptual problems, concept maps are a far better tool.
Example: Figure 1 presents a sample problem, based on the flowchart model presented in the *PLTL General Chemistry Workbook* (Gosser, et al., 2001). While a flowchart gives a framework to a problem, it is not too rigid and allows space for alternative solutions. For example, in Figure 1, the flowchart is written showing how to solve the problem in three different ways. The flowchart allows the students to analyze the different solutions and compare the number and difficulty of each set of steps.

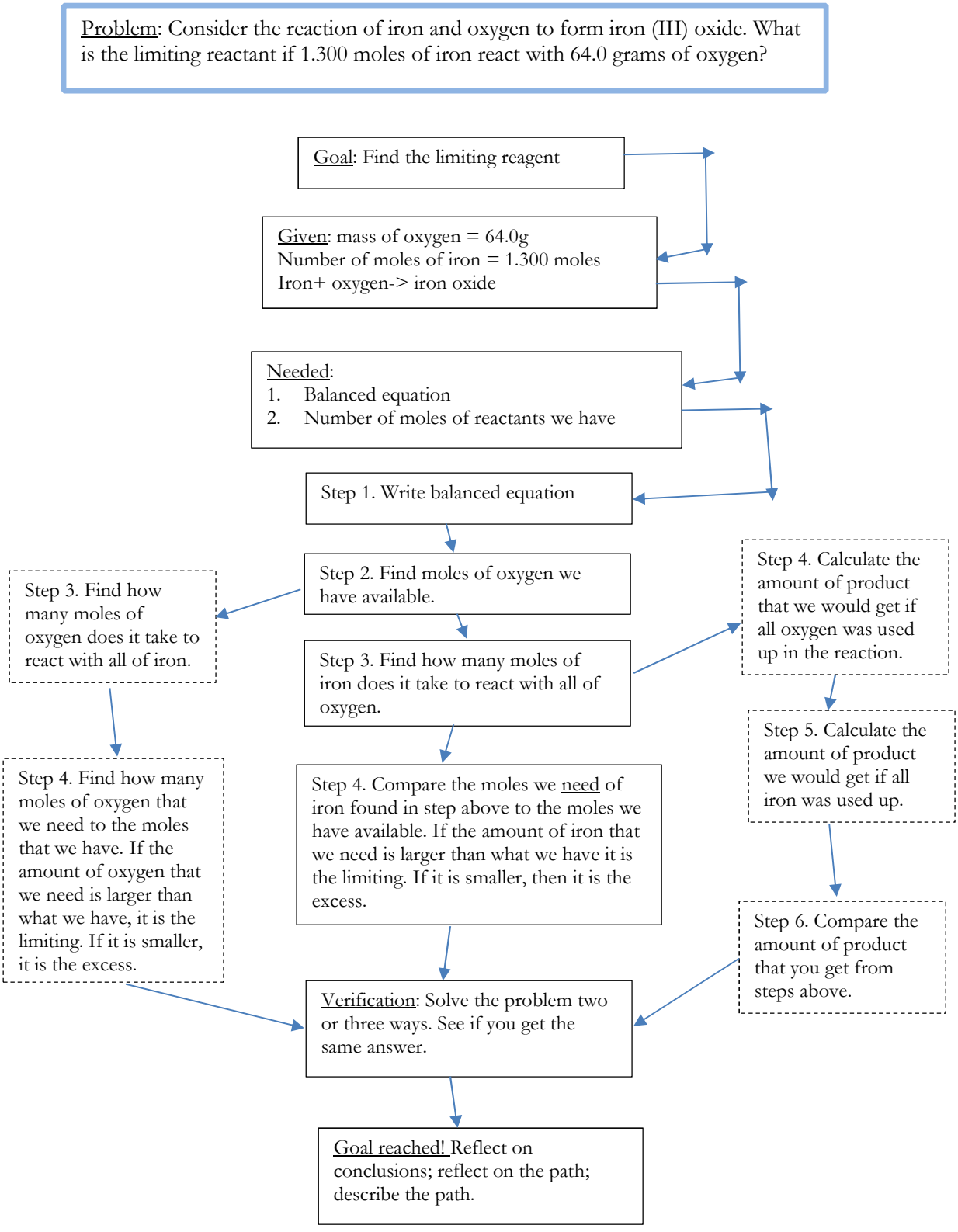

Figure 1. Flowchart of a chemistry problem, by Elina Yusufova, adapted from the *PLTL General Chemistry Workbook,* p 34, Gosser, et al., 2001.

Contributors: Peer Leaders from the following institutions
Dan Parker, State University of West Georgia; Cathy Hargis, Miami University of Ohio; Amber Krummel, Portland State University; Stacia Weaver, Coastal Carolina University; Brian Yates, San Jose City College; Elina Yusufova, City College of New York
With additional contributions from peer leaders at the University of Rochester:
Chad Brown, Nick Krebs, Mark Kubaszewski, Alma Muharemagic, Christina Snopek

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Cite This Article as: Parker, D., Hargis, C., Krummel, A., Weaver, S., Yates, B., & Yusufova, E. (2012). Twenty Workshop Techniques. Peer-Led Team Learning: Leader Training. Online at http://www.pltlis.org. Originally published in *Progressions: The Peer-Led Team Learning Project Newsletter*, Volume 2, Number 3, Spring 2001.