The Workshop Project Newsletter

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PROGRESSIONS: PEER-LED TEAM LEARNING

IN THIS ISSUE:

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PREPARING FOR WORKSHOP

To be an effective group facilitator, peer leaders must feel comfortable with both the subject material and the methods and activities that will enable all students in the workshop group to master the concepts.

This article addresses steps a new leader should take to prepare for the first workshop, when the individual students get to know each other, and for weekly meetings when students are working as a team.

Knowing the Basics

There are many fundamental guidelines that are needed to be in place for a workshop group to become successful. These are simple elements to be taken into account when preparing for the weekly workshop that are often overlooked by workshop leaders. *(Note: Some PLTL Workshop programs may also have a "Coordinator" level and role, arranging schedules for new and returning workshop leaders. Some of the comments that follow assume some type of coordination between the individual leader and the PLTL program, including involvement with administrative tasks, faculty, and leader training.)*

I. Preparing for the first workshop of the semester

? Make sure that you know the workshop schedule.

Know the date of the first workshop, your workshop's assigned day and time, and which unit will be covered for your first workshop.

? Know the time commitment involved in workshop leading.

Talk to the professor or experienced lead-

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TWENTY WORKSHOP TECHNIQUES

Workshops 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

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PROJECT NOTES: THE STUDENTS' VOICE

We should recognize what tremendous contributions students have already made and as a consequence be ready and willing to listen, even if what they are saying sometimes challenges our cherished beliefs.

It is well known that in the PLTL Project we put full trust in the students to speak for the Project, to represent the PLTL model from their unique vantage point, being on the "frontline" of the actual implementation of PLTL. So it is natural that this issue of *Progressions* is devoted to the students' voice. Some of the students attending the Leader Training Conference at the University of Rochester (June 2000), decided to initiate an effort to write from the student leader's point of view, to pass on their knowledge and experience to other leaders. This effort has been enlarged and facilitated in its development by Lydia Tien (University of Rochester) and AE Dreyfuss (City College of New York), who organized a meeting in April at the State University of West Georgia where 16 experienced student leaders from nine institutions worked on compiling their collective knowledge (see page 10). One of the outcomes of that meeting was a commitment to write articles for *Progressions*, which we are pleased to share. I think that the readers of these articles will recognize the authentic voice of students who have great insight into and commitment to the PLTL model. We felt that at this time, as the Project undergoes "quantum leaps" in magnitude, it is important to focus on students and to remember to look to the students for input and contributions. One of the foci of the Goucher Leadership Conference will be to find ways to ensure that the students' voice never goes unheard. We should recognize what tremendous contributions students have already made and as a consequence be ready and willing to listen, even if what they are saying sometimes challenges our cherished beliefs. For instance, Okason Morrison's research into the disparity between conceptual learning as a goal and on exams is a frank reminder of the difficulties we face as we attempt to change curriculum.

From the very outset of the PLTL Workshop Project, it has been stirring for me to watch as student leaders have had the courage and poise to stand before faculty audiences across the country and project the PLTL model so well, challenging the largely unquestioned top-down lecture model of instruction. The students have always been the greatest force in the PLTL Project, and if we are to continue to be successful we will have to continue to invite student participation in every phase of the Project – materials development, leadership training, course evaluation, dissemination, and institutionalization. A look at the number of student leaders as a function of time (Figure 1) gives one a glimpse into the potential influence that they have, and should remind us of the influence that we are having.

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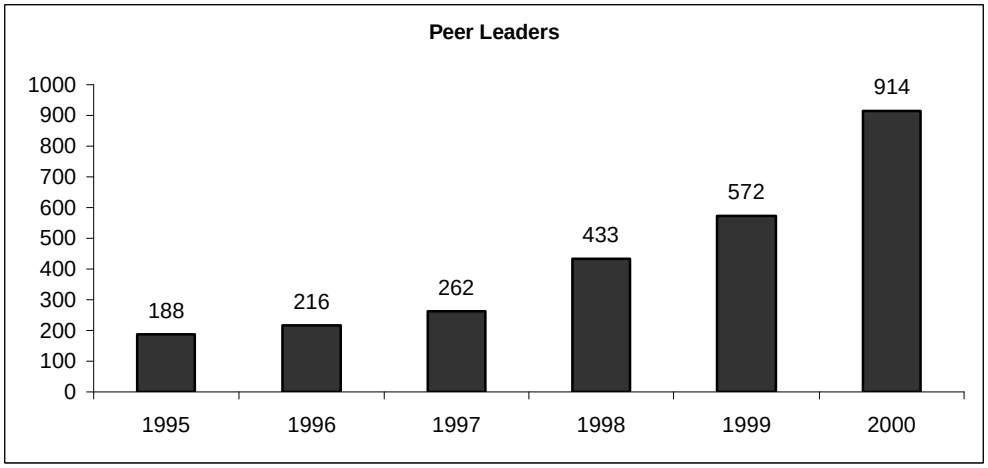

Figure 1. Number of peer leaders per year participating in the Workshop Project.

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THE MULTI-FACETED LEADER

The role of the workshop leader is constantly oscillating, providing students with different types of support. It is of the utmost importance that a peer leader have access to various means for contributing to each student's learning within the group. Experienced leaders have found the following roles most often in use. Included are the purpose of the role and the circumstances in which the role may be applied.

The Perceptive Communicator

It is the job of the perceptive communicator to be an active listener. Use your awareness of learning styles and personality types to read the silent communication from your group.

This role is always "on." However it is particularly useful to sense frustration/aggravation when the group is overwhelmed by a controlling student, when a student is withdrawing from the group, or when a student is confused. For example, when confusion from a student is perceived, encourage other students to present their ideas in different ways, e.g., work the problem on the board for a visual learner.

The Motivator

The role of the motivator is to instill confidence and encourage students to think outside the box.

The motivator role is useful when students have become misdirected and/or are unable to assist each other. Humor can lighten the mood, creating a non-threatening environment and encouraging group discussion. Be careful not to lose direction here. Encouragement promotes confidence and reassurance for success when morale is low (i.e., post-exam blues). A technique one may employ is the use of leading questions when students are misdirected.

Tip: Know as a motivator you cannot leave the student hanging, e.g., keep to a 3-5 minute time limit at the board. If this time limit is approached, bring in another student to assist, taking the pressure off of the first student, but allowing both to have experience at the board.

The Task -Master

The role of the taskmaster is to keep the group on task from beginning to end.

This role is always looming in the subconscious. When starting a workshop, minimize idle chitchat in order to effectively manage your limited time. This can be accomplished via round robin or other techniques. As the group wanders off-task, bring it back by asking, "What is this question asking?"

Tip: This is a full-time role. Make sure you keep a eye on the clock, and stay on task.

The Builder

The role of the builder is to create a community of free trading of ideas and knowledge within the workshop, thereby minimizing competition among the individuals.

In the first week an attitude of "we're all in it together" is achieved with the use of icebreakers. Later in the term, the builder will maintain the cohesiveness of the group by allowing the group to debate in a non-intimidating environment.

Tip: In later weeks try playing games that promote reflection and review, such as using old exam questions; divide the group to compete to see which sub-group can answer the most questions correctly.

The Relationships

There are three fundamental relationships: leader & student, leader & leader, and leader & professor. Each of these forms has a different dynamic, with the same general goal. The workshop leader is a liaison between the workshop student and the professor.

The leader & student relationship is that of experienced and inexperienced colleagues. This employs mentoring, facilitating, and the above mentioned roles of the leader. The leader & leader relationship is one of support. It is important to realize the leaders are coworkers and resources for one another. The blending of the new and experienced leaders is fundamental for success. The leader & professor relationship is the mirror image of the leader and student relationship in which the professor is the leader's mentor and reference.

Tip: Treat all relationships with equal respect.

The Perimeter Patrol

The role of boundaries is to protect the leader and the workshop team from uncomfortable situations.

These should be discussed at the first workshop which positions the group with respect to the leader. Convey time restraints, the leader's availability and the tools (e.g., communication tools, exam-prep tools, etc.) the leader is willing to provide. It is not the job of the leader to do advising; however, the leader can act as a liaison to direct a student to such services and make the professor aware of potential concerns.

Tip: The leader must decide what personal information he or she wants to disclose. Do you want to be contacted at the wee hours of the morning? Should you be involved in personal issues of the student? It is always okay to have a list of services a person can access, but it is usually wise not to get involved.

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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. 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

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out the problem on their own and only use this idea 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

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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 inline 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-class 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 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.

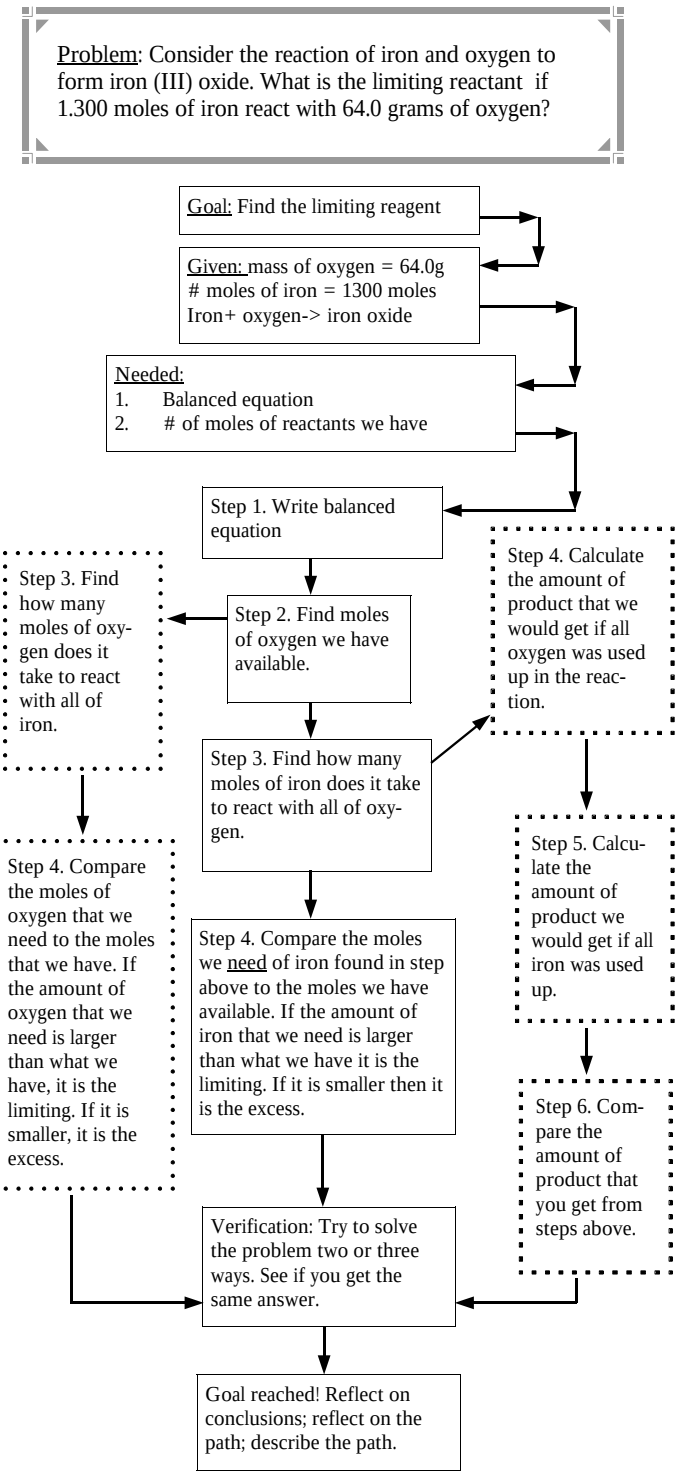

Figure 1. Flowchart of a chemistry problem, by Elina Yusufov, adapted from the *PLTL General Chemistry Workbook*, p. 34 (Gosser, et al., 2001)

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MOTIVATION IN THE WORKSHOP: HOW CAN LEADERS USE THIS KNOWLEDGE?

Getting students motivated to engage with the material in the workshop setting has proven to be one of the main difficulties for me as a workshop leader. For the workshop model to be effective, it is imperative that the students begin working with each other, asking questions, and moving through discussion to reason to some kind of answer. One of the roles that the workshop leader plays is to provide the initial energy to motivate the students to begin engaging with the workshop problems. Past this point, however, the unfolding of a successful workshop session involves the development of self-initiated participation by the students over the course of the semester. If we as workshop leaders had a better idea of the conditions required for the development of self-motivation, *intrinsic* motivation, to take place, then we could use this knowledge intentionally to cultivate those conditions favorable for the growth of students' active participation. The central questions posed for this endeavor then are to determine 1) what conditions facilitate the development of self-motivation in people, and 2) what are some testable strategies to realize these conditions? An answer to the first question comes from motivational psychologists Ryan and Deci's *self-determination theory*. A comparison of my own anecdotal observations of workshop dynamics to the ideas in self-determination theory will address the second question, and can hopefully guide the workshop leader's interactions in the workshop setting towards the facilitation of intrinsic motivation.

Self-Determination Theory (SDT) is a theory of motivation that focuses both on the social and environmental conditions that either facilitate or undermine intrinsic motivation, and on the developmental processes in human beings leading from external to intrinsic motivation. These two directions are elaborated by two subtheories, Cognitive Evaluation Theory (CET), which examines those circumstances that either satisfy or neglect three psychological needs required for intrinsic motivation: *autonomy*, *confidence*, and *relatedness*; and Organismic Integration Theory (OIT), which is a model describing both the developmental process whereby external motivators can be integrated into a person's being, and the different types of motivation along a continuum from amotivation to intrinsic motivation. It is a fundamental assumption of SDT that intrinsic motivation is an innate tendency in human beings. Evidence for this is readily apparent from even casual observations where children exhibit natural curiosity, exploratory behaviors and play in the absence of any externally derived rewards. Furthermore, this innate tendency can be either facilitated or undermined depending on the social contexts in which a person is placed. We will consider both sub-theories in turn.

CET affirms the common-sense assertion that social contexts which support a person's perception of his/her own *competence*, the ability to perform a task well, is instrumental in facilitating intrinsic motivation. Examples of such supportive conditions include positive performance feedback, optimal challenges, and freedom from demeaning evaluations (Ryan and Deci, 2000). A person must also experience his/her competence as self-determined, by a sense of *autonomy* (Black and Deci, 2000). In other words, the source for motivation to act comes from within, whereas a controlling social context places the source for motivation externally. Consider the following situation illustrating competence without autonomy: when questions are posed, Mary is always able to contribute a part to finding an answer. However, it takes calling on her directly to participate. Mary is competent but she doesn't have a strong sense of autonomy for the given tasks. Support for autonomy means creating conditions where a person has a "sense of *choice*, *volition*, and *freedom* from excessive external pressure toward behaving or thinking in a certain way" (Ryan and Deci, 2000, italics added). Finally, CET points to a third psychological need, *relatedness*. Children working on an interesting task in the presence of an unresponsive adult stranger displayed a very low level of intrinsic motivation (Ryan and Deci, 2000). Support for relatedness can be described as making authentic attempts to "be there" for someone, or being prepared to invest one's attention in another.

OIT both articulates a continuum of types of motivation from the most externally regulated (amotivation) to the most internally regulated (intrinsic motivation) and details the context which fosters or hinders the movement from external to internal regulation of behaviors. The spectrum of motivational conditions is also intimately related to the value invested in the action; the more a personal internalizes and integrates the value for particular actions, the closer that person comes to intrinsic motivation. The delineated types are:

1. Amotivation - Either the lack of action or unintentional action can arise when a person does not value the action, does not feel competent for it, or does not expect the action to yield a desired outcome.
2. External regulation - Motivation that is elicited purely by contingency of reward or external demand, and lacks any internal motivational component.
3. Introjected regulation - This is the least internalized

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form of motivation where a person acts out of fear of failure, or necessity to succeed to maintain self-esteem.

4. Identification - This form of motivation involves conscious recognition of the value of an action which is accepted or identified with and is more autonomous and self-determined.
5. Integration - The most autonomous extrinsic motivation when the value of an action is fully integrated into a person's core sense of self, having been evaluated and accepted as important.
6. Intrinsic Motivation - Above and beyond the integration of values, this form of motivation is characterized by feelings of inherent pleasure in the performance of the action.

Among the determining factors for the development of more integrative and intrinsic motivation are support for perceived competence, relatedness as "belongingness and connectedness with others" (Ryan and Deci, 2000), and finally, the positive experience of autonomy. Ryan and Deci's comments on this topic are worth quoting: "Contexts can yield external regulation if there are salient rewards or threats and the person feels competent enough to comply; contexts can yield introjected regulation if a relevant reference group endorses the activity and the person feels competent and related; but contexts can yield autonomous regulation only if they are autonomy supportive, thus allowing the person to feel competent, related, and autonomous."

Self-Determination Theory informing workshop practice

There are some straightforward general conclusions to derive from SDT that are immediately applicable to the problem of student motivation in the workshop setting. The workshop leader obviously does not want to emphasize external regulation (e.g., contingency of rewards based on performance in the workshop), which could undermine the satisfaction of any of the three psychological needs of competence, autonomy, and relatedness. The acquisition of practical methods to enhance motivation in the unique setting of the workshop session must be gained either through trial-and-error or from experienced workshop leaders. In short, what techniques can one employ to foster conditions beneficial to the posited psychological needs?

In my workshop, I was faced with two situations pertinent to this discussion that have stood out as prime candidates for a SDT-informed interpretation leading to potential techniques for enhancing intrinsic motivation.

A. "The dangling carrot before the donkey" dynamic

Casual discussion with other workshop leaders revealed corroborated observations that more often than not, students would direct questions and responses to the workshop leader rather than to fellow students. In my own experience, this was aggravated by students' perception that I had the one correct answer "in my head," thereby making it their job to determine, based on my responses to their guesses, what that correct answer was. This condition invariably led to frustration and diminished motivation. In SDT terms, this non-optimal condition, undesirable by workshop student and leader alike, did not support the perception of their own competence or autonomy because it placed both the answer and the source of motivation outside of themselves. The students, so to speak, were situated in a context where they perceived themselves as chasing after a carrot frustratingly out of reach.

This situation caused me as much consternation initially as it did the students because I felt the dynamic was somehow off-kilter but in the heat of the moment, I had no alternative method to employ. As the semester progressed, it occurred to me that the technique I needed was that of breaking down the large group into two-three person subgroups to solve problems. In addition, I would move between subgroups asking how they were progressing. This freed me from being at the center, allowing me to give more attention to smaller groups of students. Under these conditions, non-talkative students were much more likely to engage in discussion with their classmates. Initially, when students were back in the larger group, the context reverted back in part to the initial condition. However, as students became used to working in small groups, I found that they were becoming more active upon coming back to the larger group. SDT predicts that if you cultivate conditions where competence and autonomy support are present, you will foster greater internalization of the values of a social grouping (like the workshop) and movement towards more intrinsic motivation. It appears that the small subgroups provided a context which was less threatening to their self-perceived competence by being more secure and personal; the subgroups also supported their autonomy because there was not the (perceived) demand to answer the questions; the small groups gave the members a greater sense of choice and freedom to direct the discussion. This finally provided support for relatedness, as the workshop leader was able to exhibit personal attention and interest in the problems and difficulties that each subgroup was encountering. I would predict that had the workshop continued for another semester, or had all the students already had experience in a workshop environment during high school, that this movement towards more active participation and integrated external motivation would have increased indefinitely.

B. "Allowing the voice of students' autonomy to speak"

I have come away with two techniques to foster auton-

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omy support in the workshop, one of which emerged directly from my experience as a leader. Both techniques entail creating situations where feedback in both directions-between the workshop leader and students-can take place.

First and foremost, the workshop is comprised of participants, including the workshop leader who plays a facilitation role. Just as a healthy democracy fosters a socio-political environment which encourages its participants to find their voice by being active and empowered, a workshop where the students can voice their complaints, pose questions asking for justification for the philosophy governing the workshop, and make suggestions to improve the workshop environment are ideas supportive of student autonomy. As participants who have a say about how the workshop setting can be conducted, students will be much more likely to place value in the activity and engage in the material with more energy. I discovered this serendipitously midway through the semester when I opened up the floor to anyone who wanted to make comments regarding the mid-semester workshop evaluation. A flurry of discussion ensued, resulting in a clarification for them about why I conduct some things the way I do, clarification for me about what frustrated them, and new agreements and suggestions about how we could get more out of the workshop experience. Following the discussion, the students were highly energized; and it turned out to be one of the best workshop sessions of the semester for me. Regarding this technique, I later recognized that its success could be dependent upon the "personality" of the group as a whole. One of the workshop groups responded very positively, while my other workshop group did not. It cannot hurt to try this exercise as it might help improve the workshop dynamic.

The second technique, along the same lines, lauds the benefits of initial (and ongoing) discussion about the philosophy and goals of the workshop and what a workshop entails (e.g., the role of the leader, the role of the students). I found out late in the course that students signed up for workshops with some correct and some incorrect notions about what it would be like. I wish that I could have known this at the beginning of the semester so that I might have facilitated a good introductory discussion about the roles that we each are supposed to play, workshop leader and student alike. Also, this could have established from the first session a much more personal environment by saying more about ourselves so that we could establish a positive identity in the group.

The one thing that I have realized that I truly appreciate about workshops is that as a workshop leader facilitating both discussion and environment in which discussion takes place, I can obtain instant feedback regarding the dynamic of the group if any variable is changed. The workshop leader is in a direct position either to promote social contexts that further the development of intrinsic motivation, or interrupt its expression. By possessing the right tools and theory to inform the use of those tools, workshop leaders can change the world, a few students at a time.

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STUDENT LEADERS UNITE TO WRITE

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Other viewpoints were represented by contributors from various parts of the country, including Amber Krummel (*amberkrummel@hotmail.com*), Portland State University (OR); Brian Yates (*brianyates@earthlink.net*) and Carl Clarke (*Carlshmarl@aol.com*), both from San Jose City College (CA); Carson Robertson (*carsonr@selway.umt.edu*), University of Montana (MT); Yvonne O'Connell (*ymoconnell@hotmail.com*), St. Xavier University, Chicago (IL); Cathy Hargis (*cathyhargis@hotmail.com*), also from Miami University (OH), Awista Ayub (*aa003g@mail.rochester.edu*), University of Rochester (NY); and Elina Yusufov (*elina_yusufova@hotmail.com*) and Michael Tubon (*metalmonkey81@aol.com*) from the City College of New York. Lydia Tien (*ltie@troi.cc.rochester.edu*), University of Rochester, coordinated the Conference, which was also attended by AE Dreyfuss, (*aedreyfuss@aol.com*), PLTL Project Manager.

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ALGORITHMIC PROBLEM SOLVERS OR CONCEPTUAL THINKERS: WHICH IS MORE FAVORED IN CCNY'S CHEMISTRY COURSES?

Science in the classroom, and chemistry in particular, is not adequately applied to the outside world. Students learn about the gas laws, but are the gas laws seen as relevant to anything outside the classroom? These remarkable concepts are often remembered merely in the form of an equation. Once one is given the necessary data, a numerical answer can be obtained by the use of a formula. This algorithmic process takes little mental effort and can be mastered if repeated several times. It is unfortunately accepted as a testing method in the introductory chemistry courses (primarily for science and engineering majors) at the City College of New York as the prime indicator of acquired knowledge.

Is true understanding attainable through the memorization of a formula? Of course not. However, the use of algorithms is an efficient way of testing. While not everyone is pleased with this method of evaluation, it is used at City College. This research paper is an analysis of the introductory chemistry course, its algorithmic vs. conceptual side, and how much emphasis is placed on each aspect.

Humans are creatures of habit and we tend to learn best by repetition. We practice with the intention of perfecting our skills. Loosely speaking, any step-by-step method can be considered an algorithm. However, for the purpose of this paper, we will think of algorithms as mathematical operations performed in some form of structured, cohesive manner. The balancing of an equation for example is algorithmic. This approach to learning may be preferred by many students and instructors alike as easy to master and easy to grade. There are, however, a peculiar few students who are more fascinated with a concept than its reduction to an algorithm.

Conceptual thinkers are normally out-numbered by algorithmic problem solvers in the average chemistry classroom. The conceptual students, referred to as the *second tier* by Nakhleh (1993), are more concerned about the *why* than the *how* for a particular concept. While the algorithmic student is satisfied with getting an answer, a number representing the partial pressure of a gas, the conceptual student is more intrigued by the orientation and rate of collision of the molecules. While it can be argued that it is more important to understand the concept because numbers can always be changed, what is taken as evidence of understanding is the recorded grade. That grade is determined by the successful execution of algorithmic steps. It seems logical that with the understanding of a concept, the algorithm should be easy. It should be noted, however, that the time needed for true comprehension of a concept far outweighs the time needed to memorize a formula and practice a few examples. The average introductory chemistry lecture sessions at City College last three hours per week, and the time allotted for workshop is nearly two hours. During a week, several sub-topics may be covered. In trying to fully understand a seemingly complicated topic such as the quantum theory, along with the pressure of other courses, and everyday life, the conceptual student is placed at an obvious disadvantage. Chances are, when the exam comes around, only two out of a total ten points for a particular question are conceptual. The remaining eight points are totally algorithmic.

To quantify this hypothesis, the topics covered on the course syllabus were categorized according to their algorithmic or conceptual content. These categorizations were somewhat subjective. This task of classifying the general topics was a challenge in itself: certain topics could be considered equally conceptual and algorithmic, and were placed in a sort of algorithmic-conceptual hybrid class. All the topics had a mixture of both a conceptual and algorithmic aspect, even if disproportionate. After all, there must be a concept behind all scientific belief, whether factual or theoretical. For research purposes though, topics were categorized according to how they were traditionally tested. From a total 13 topics, seven were exclusively algorithmic, four were in the hybrid group and the remaining two were under the conceptual banner.

For example, the topic of thermochemistry was placed in the algorithmic category because all the questions on the last three exams required only calculations. It is possible for an instructor to ask for an explanation concerning the enthalpy changes occurring during the bond-breaking process. Usually, though, this does not happen.

Learning styles have a direct relation to conceptual thinkers and algorithmic problem solvers. Sequential learners, according to research conducted by Gregorc (1982) , are practical, methodical, ordered and prefer a sequential, step-by-step approach to doing things. A learner with these characteristics is undoubtedly algorithmic. The Random learner, according to Gregorc, is inventive, emotionally attached to the material and even has an inner guidance system. The conceptual thinker would fit the description of Gregorc's Random learner more closely than the algorithmic student. It can be said then that learning styles are determining factors in the efficient transfer of knowledge, and should be considered by those responsible for guiding

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another person on the path of learning. Most importantly, workshop leaders, who are expected to have a closer bond with a student than a professor would, should be familiar with the different learning styles and the type of student they are trying to help, whether that student is conceptual or algorithmic.

In a survey completed by 24 workshop leaders, twelve leaders stated that they always consider different learning styles when they plan for their workshop, eight usually do and four factor in different learning styles on an occasional basis. If workshop leaders are not sensitive to the few conceptual students, then the odds which are already stacked against the conceptual students will only increase. Ten of the 24 workshop leaders surveyed think that our current workshop materials are too mathematically oriented (as even the second half of the introductory course is biased toward algorithmic problem solvers). Yet workshop materials often include conceptual exercises, such as concept maps, modeling and visual organizers (Gosser, *et al*., 2001).

The final exam, unfortunately, is a different story. The final, composed by a group of three faculty members, carries most of the weight for the student's overall grade, and has shown an increase in the number of points awarded for algorithmic questions between the Fall 1999 semester and the Fall 2000 semester. The total number of points allocated to algorithmic questions, according to the general categorization of topics, rose from 48% (the exam has a total of 100 points) in the Fall of 1999, to 53% and then to 64% in the Fall 2000.

It is obvious which of the two types of students are favored by City College's introductory chemistry courses. Is this a bad thing? It is traditional to use the algorithmic-based form of evaluation at this level, thus making it the usual method of testing. Higher-level chemistry courses may pay more attention to conceptual matters. The conceptual method relies more on an explanation which gives room to ambiguities, the opinions of students, and perhaps the leniency of the evaluator.

Most students have grown accustomed to the algorithmic method of problem-solving and so a radical change in the evaluation method might meet with initial resistance. Instead instructors and workshop leaders should try and implement more conceptual methods of testing over a prolonged period of time. Algorithmic problem solvers are the majority in the science classroom. Despite being fewer in number, the conceptual students' approach should still be considered more often for deeper understanding by all types of learners.

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TWENTY WORKSHOP TECHNIQUES

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ers to determine how much time is required to prepare and run a successful workshop. Make sure to manage your schedule so that you have enough time to adequately prepare for your workshop sessions.

? Know where your workshop is.

Before your first workshop, make sure that you know what building and room your workshop will be held in. Check out the room ahead of time. Are there desks or tables? Are they movable? Are there chalkboards or dry erase boards? Do you need to bring your own supplies?

? Know what material you will be using.

There are several different workshop manuals available. Make sure that you are familiar with the materials that you will be using in your workshop. Obtain the manual or workshop units ahead of time to get a feel for the structure. It is also helpful to have at your disposal a copy of the textbook that is required for the course.

? Know how the workshop is graded and integrated with the lecture.

Different schools and professors have different grading styles and course integration. Talk to the professor(s) about grading and attend a lecture if possible. This way you will have an idea of where your students are coming from.

Also talk to the professor(s) about how the workshop problems will be integrated with tests, for example. Make sure you know how you will be grading your workshop students, what percentage of their grade the workshop entails, and how their workshop grade is broken down, if applicable.

Examples of workshop grading styles

At Coastal Carolina University, the workshop can be taken for either 0-20% of the grade as designated by each student. Each workshop is worth 30 points: 15 for attendance, five for preparation, five for participation, and five for cooperation.

At Miami University (OH), the workshops end up counting as a test grade. Each workshop is worth four points. This is based mostly on the completion of students' self-tests. However, workshop leaders can use their discretion to account for lack of participation.

At the City College of New York, each professor has a different way of integrating his workshops. Some professors factor the workshops as a range of +/- 5 points of the student's grade. Others count workshops as 10% of the students' final grade. There are three components: the self-test, participation, and the quiz.

Knowing your students

One of the most important components of the workshop is setting up a comfortable learning atmosphere for your workshop students. In order to do this, you must make a great effort to get to know your students and allow them to get to know one another. This needs to be started from the very first workshop.

? Know their names.

Obtain a list of students who will be in your workshop group prior to the first day. Read over the list several times to familiarize yourself with their names. This will help you to learn their names more quickly when you actually meet them.

? Know how many students will be involved in your workshop.

The number of students within each workshop can vary greatly. The optimal number ranges from six to eight students, but your situation may depend on local conditions. The number of students will determine how you will run your workshop and what techniques you will use. (For more, see *Twenty Workshop Techniques*, page 1.) Make sure your room assignment is adequate for your group size.

? Know what information you will want to collect from your students.

It is very important to be able to contact your workshop students in case there is a change in the workshop schedule. Information such as e-mail addresses, phone numbers, or address/dorm room should be obtained on the first day. Generating this list of information not only helps you, but also helps your students to establish a support system. It is up to you and your students what information will be exchanged.

? Icebreakers/Team builders

Icebreakers and team builders are very important; they help you not only learn your students' names, but also foster a sense of community. This sets up an atmosphere in which your students feel comfortable enough around each other in order to ask questions, participate, make mistakes, and learn together without feeling intimidated.

Examples of effective ice breakers/team builders

? Name games: Have each student say their name, major, and two interesting facts about themselves.
? Adjective game: Each student has to choose an adjective that describes her/him and starts with the first letter of their first name. If you feel comfortable enough, you can have each student act out their adjective.
? Pair students up and each person must interview the other and present each other to the group.
? Blanket game: The group is split into two teams. A blanket is held up between them, so that neither team can be seen by their opponent. Each team chooses one person to sit down in front of the blanket. The blanket is then dropped and that person must say the name of the person who is on the other side. Whoever can

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get the right name first wins. The loser then must move over to the other team. The team that collects everyone wins.

? Two truths and a lie: Each person writes down two truths about themselves and one lie. They then read their entries out loud and the group must figure out which one is the lie: The crazier, the better.

? Famous person pairing: Each person gets a name tag with a famous person on it placed on their back so that they can not see it. They then must walk around and ask other people questions about who they are. They can only ask "yes" or "no" questions. Once you have figured out who you are, you then must find someone who would be your partner or pair. For example: Batman and Robin. This can also be done with scientific or mathematical concepts or concepts from other disciplines.

? M&M™game: Have each student take some M&M's when they walk into workshop. Tell them not to eat the M&M's. For each M&M that is taken the student must tell one fact about themselves. You can make it so that each color represents something different they have to tell about themselves. For example, tell their hometown and an interesting fact about their hometown.

? The same game can be done with toilet paper. Tell each student to take some toilet paper squares. Then for each square they have, they have to tell an interesting fact about themselves.

Another idea is to bring treats to your first workshop, such as cookies or candy. But watch out not to give students too much sugar: it may not allow them to concentrate on the workshop itself.

Knowing the expectations

Workshops have very specific goals or expectations that should be established and communicated to the workshop leader prior to the first workshop by the local PLTL program. First, your professors are more than likely going to set a goal for the workshop leaders themselves. This can involve the following:

? Expectations from the professors

Professors should set up a good communication system with the workshop leaders from the very beginning of the semester. The workshop leaders need to understand what the professor is expecting the students will get out of the workshop and what they are expecting from the leaders. This could involve how much time and effort will be put into the workshop.

? Expectations for yourself

Before going into your first workshop, it is very important that you set goals or expectations for yourself. This helps the you, the workshop leader, know what needs to be done and what doesn't. This involves what you want to get out of the workshop environment and from your students. As Dan Parker, from the State University of West Georgia said, "...To lead the best damn workshop I can."

? Expectations for your group

Workshop leaders need to come up with what they will expect from their workshop students themselves. This needs to be established and conveyed to the students on the first workshop of the semester. If your students know what you are expecting of them, then there can be no cause for controversy or questioning over grades. If they did not meet the expectations of the workshop leader, then their grades should be affected.

II. Preparing for the weekly workshop

There needs to be some level of preparation before each workshop that you facilitate. No matter how many times you have led a workshop, each group and each week you may encounter a new situation or problem. If you are prepared, then you may be able to identify potential problems ahead of time. These problems can then be addressed before the students get too frustrated. There are many different approaches for preparation.

? Have a weekly meeting to go over workshop material with the faculty and/or experienced leaders.

Weekly meetings are a great tool to help workshop leaders. On some campuses the professor leads the meeting, modeling questions and problem-solving styles. On other campuses, a coordinator (or experienced leader) may lead the meeting, also providing appropriate modeling. The weekly meetings are a very effective strategy, providing *just in time* problem-solving reviews and suggested approaches.

Weekly meetings are effective because the workshop leaders have a chance to work out the problems in a group, just as their workshop students will. They also have a support structure in place with the other workshop leaders as they determine how best to solve a problem. Since there are often many ways to solve each problem, the meeting allows each workshop leader to see how the other leaders present or work through problems. As a result, each workshop leader better understands, and knows to anticipate, some of the different issues and problem-solving techniques that may arise. This may also allow you to determine where your students may make mistakes. If you can anticipate where the problems areas will be, the more effective you can become as a workshop leader.

In addition, these meetings allow the workshop leaders to determine if there are any problems from the materials that will be omitted in the weekly workshop. Some of the problems may not be pertinent to the current lecture or

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STRAIGHT DOWN THE RIVER: RAFTING AND THE WORKSHOP TEAM

I once went on a rafting trip expecting a relaxing weekend with my friends. The experience that ensued was not what I had imagined. To begin, I was subjected to four hours of training, including how to carry the raft, paddling techniques, rescue maneuvers, and other non-essential things. I remember thinking why should I care, this truly doesn't affect me, for my raft mates will paddle, everyone will stay in the raft where they belong, and carrying the boat is for my river guide to worry about. The next morning when we set out for our adventure, I remember the guide saying, "My job is to keep you going straight down the river, and to coordinate your efforts for the benefit of all. Your job is to paddle your butt off when I tell you to, hold on when I tell you, and you will work like you have never worked before for the next two hours . . . I will make sure your work gets you where you need to be."

This is the very role we play as workshop leaders. It is not our job to do the work. It is our job to see that all workshop members contribute, and to ensure that the work of the workshop group produces results.

Many students have the mindset that they do not have to prepare, for their workshop mates will do the work, and the workshop leader will come to their rescue when they struggle. This mindset was much like mine on my rafting trip: "Why should I care? Others will do the work and our leader will make sure we do everything right." This cannot be further from the truth. When one person does not do his or her part, the team suffers. It is this team suffering that makes people pull together to solve a problem and this is how people learn. This became apparent to me on that fateful rafting excursion. When the people in our raft did not work together, we found ourselves swimming through the grueling rapids rather than enjoying the rapids from the confines of our raft.

The greatest lessons learned in life are the lessons associated with a struggle. Human nature often fosters passively learning what we deem not important, and actively learning things that are important. Nothing facilitates active learning like a struggle, and it is not the leader's job to interfere with the struggle. If the leader steps in and solves the problem, the workshop students are robbed of a golden opportunity to learn not only a chemistry or biology lesson but also a lesson about life: hard work, perseverance, and teamwork can solve the most difficult of problems.

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class, and therefore can be omitted.

? Meet with the professor to go over workshop materials.

Weekly group meetings may not be applicable or available at certain institutions. Therefore, a meeting each week with the individual professor may be necessary. The same benefits as weekly meetings can come from this. The workshop leader will be able to go over the workshop with someone who has a better grasp of the material than the leader might. The faculty member can also share key points that she or he wants students to grasp from each problem. This may contribute to a better understanding of the workshop material.

? Attend a lecture.

Sitting in on the lecture prior to an exam may be beneficial to the workshop leader. This allows the workshop leader to "freshen" up on the current material.

If the workshop leader knows how the professor is teaching the class, then perhaps the leader can adjust slightly to supplement the lecture.

? Go over the workshop problems.

If meetings with other leaders and the professor are not possible, then you will need to go over the workshop material yourself. Always remember though, that if you are stumped on a certain problem there are always other leaders or your professor to ask for help.

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The next round of applications for Workshop Project Associate (WPA) grants is due by:
October 1, 2001 for Winter 2002 implementation

For more information including application guidelines, please go to
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Progressions: Peer-Led Team Learning is a quarterly publication of the PLTL Workshop National Dissemination Project. *Progressions* is intended to build the Workshop community through discussion of the implementation of the Workshop Model at institutions of learning.

The editors are looking for contributions: please contact us with special concerns you would like addressed, have a presentation or workshop to announce, or an article that you believe others would find interesting.

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The PLTL National Dissemination Project and
the City College of New York
invite you
to the
REGIONAL CONFERENCE ON
PEER-LED TEAM LEARNING
WEDNESDAY, AUGUST 22, 2001
CITY COLLEGE OF NEW YORK
Topics will include a workshop demonstration, leader training, materials development, and information on implementation of the PLTL Model

Faculty members, learning specialists, administrators, and students are invited.

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