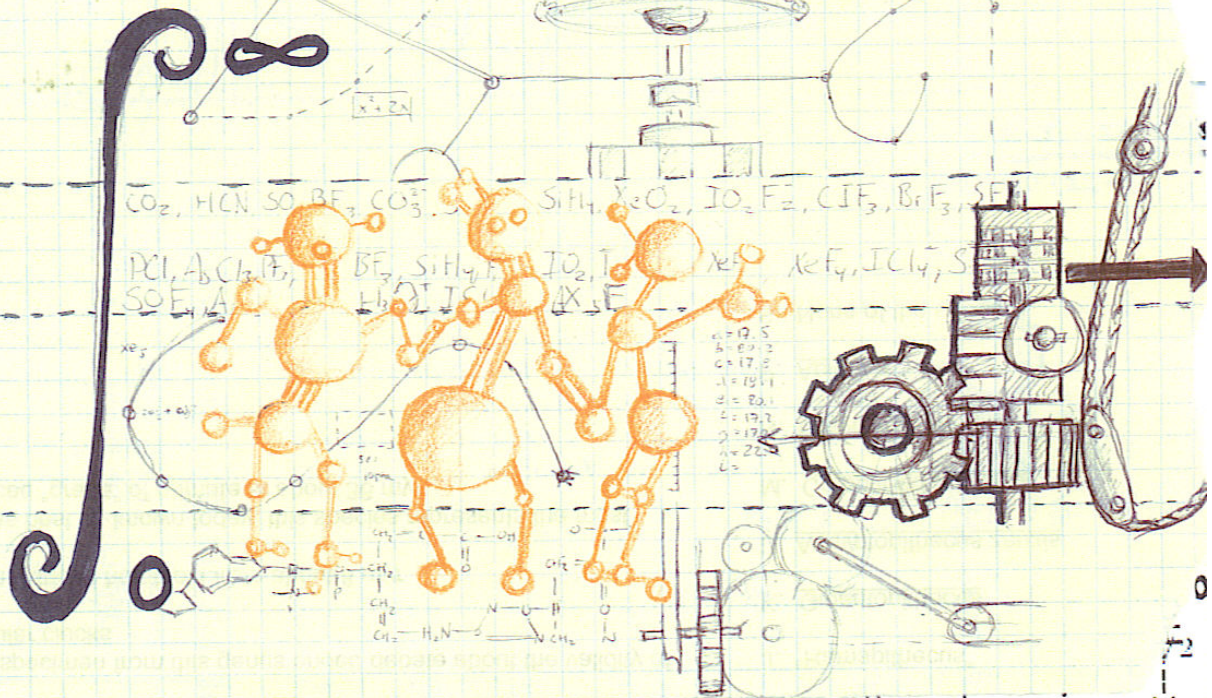
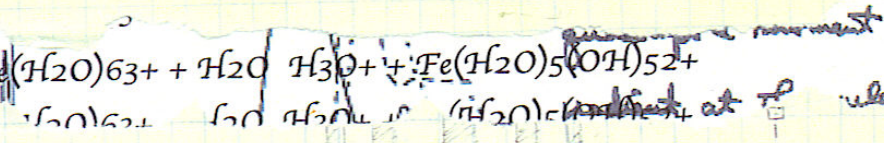


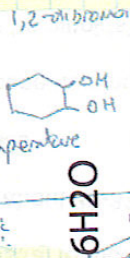
Bonding and Integration: Creating a Covalent Community

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 reacting with $3(\text{OH})^-$

PLTL



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 on becomes:



$$c_4 = [(J + 1/2)(J + 1/2)(J + 1/2)] / [J(J + 1)]$$

$$c_5 = [(J + 1/2)(J + 3/2)(J + 1/2)] / [J(J + 1)]$$

$$c_6 = [(J + 1/2)(J + 5/2)(J + 3/2)] / [J(J + 1)]$$

$$c_8 = +3[(J + 1/2) / 6J(J + 1)]^{1/2}$$

$$c_9 = +1[(J + 1/2) / 6J(J + 1)]^{1/2}$$

NaOH (sodium hydroxid
 NaCl (salt)
 H_3PO_4 (phosphoric acid)

Washington University in St. Louis

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The cover was designed by Nic Albonico.

Introduction

The announcement in the first class of general chemistry reads “PLTL (peer-led-team learning) study groups are being formed for General Chemistry. Come to the informational meeting tonight.” Most students come into general chemistry with great trepidation and are very anxious to participate in all the help that is available. Study groups sound perfect; there is a weekly session facilitated by a peer leader who has been successful in general chemistry. “Great idea, sign me up.” But, PLTL and facilitation - what do these terms mean?

Session1: “What do you mean we have to work together on a problem and what the heck is the role of the peer leader if he or she will not tell us if we are right or wrong! This is NOT what I signed up for. What is peer-led-team learning, anyway?”

The peer-led-team-learning (PLTL) model consists of study groups of approximately eight students facilitated by a student (peer) leader. The goal of this model is to teach students how to study in a group effectively, to improve their problem-solving and analytical-thinking skills, and to provide an active-learning experience. The philosophy of the PLTL model is that by studying in a group students can better learn how to problem solve and think critically. By working together and discussing the problems and their solutions, the students gain confidence in their ability to solve even more complex problems. When students decide as a group whether the answer is correct or not, instead of relying on the peer leader, they gain more confidence in their problem-solving skills.

One of the key components of the PLTL model is for students to study in a group. Surprisingly, even though students sign up for these PLTL groups, they do not believe in the usefulness of studying in a group. Actually, the students do not really know how to study effectively in a group, and they certainly do not believe in not being told whether their answer is correct or not. Indeed, creating a successful study group takes work and desire on the parts of both the group members and the peer leader. Luckily, group skills can be taught and one of the subtle results of the PLTL method is that students become more effective group members.

What are some characteristics of the PLTL group? Members of a cohesive PLTL group are a community of students whose common interest is learning chemistry. The group members need to bond together; to join securely in a relationship in which they feel comfortable asking questions and discussing complex problems. It is also crucial that individuals are integrated in the group, and that each member feels that his or her opinion is respected and that his or her participation is important to the overall success of the group. Students need to learn that the participation of everyone is essential, even if one “knows” the answer to the problem. Deeper understanding of the problem goes beyond a right answer. Underlying concepts can only be understood through discussion of the solution and seeing multiple ways to approach the problem. Group members must understand this in order to become a successful PLTL group. The essays in this book give many suggestions on how a peer leader can aid and encourage the bonding and integration that empowers students to take responsibility for their own learning and ensures that a community of scholars works as a group, not merely as individuals in a group.

Becoming a covalent community is an ongoing process that takes most of the semester and may include conflict. This process of becoming a cohesive PLTL group includes natural and dynamic group-developmental stages that we will discuss in our SAM course. As the students continue to meet throughout the semester, the character of the group changes and evolves. The methods used in PLTL and the peer-leader’s belief in the philosophy of PLTL are essential for the success of the group. As with most processes, there will be forward and seemingly backward progress, but over the semester, the group dynamics will mature and the group will cohere with the help of the peer leader, always striving to become a covalent community of learners.

Growing into the peer-leader position is a process also. This book is a start. The weekly PAM and SAM courses are to help you to become effective PLTL facilitators. You will bond and form your own community - a community of peer leaders that now spans multiple disciplines. We will grow with each other this semester, share our concerns and our successes, and learn from each other in order to further enrich the entire Washington University PLTL community. Now, I urge you to start reading the thoughts

and suggestions of last year's peer leaders, and I look forward to becoming part of a learning community with you this coming semester.

Regina Frey

Adding Some “Flavor” to PLTL

by Meredith Albin

When your group of Chemistry students walks into PLTL that first Sunday, they'll probably have a lot of expectations and misconceptions about what it will be like. The mood will be pretty somber, because they'll be in a room with strangers about to spend two hours doing work for a class they probably don't even like. They won't be too excited about getting to know anyone, especially you, because you're some freak who actually did well in the class, and if that weren't bad enough, you actually want to spend another year *mentoring* it!

If you want your group to be successful, you're going to have to create a fun and positive atmosphere. Take time in the beginning to play icebreakers, learn names, and acquaint everyone to the philosophy of a PLTL group. Make sure that when people tell you their names, you actually remember and use them frequently so that the group members will get to know one another as well. If the students do not feel comfortable with their fellow group members, they won't participate or gain confidence in their capabilities, and therefore will not get the full benefits of the group work.

Do not let the sessions become mundane – you don't want your students to wake up every Sunday morning dreading the two hours they'll have to spend with you. Even little things like changing up the order in Round Robin, calling on people when they're not expecting it, or having people move around the room to switch up the groups will keep them livelier. You may be hesitant to do this at first because unexpectedly calling on someone will put them outside of their comfort zone, but in the long run this is what will really help them grow and improve. Bringing candy or other treats is also helpful.

While it may be difficult, don't be afraid to admit that you don't fully understand something. You're a much better role model to the group as a person who didn't fully comprehend all of the topics but worked hard and made it out with an A than as a Chemistry “goddess” born with a natural, infallible knowledge of the subject. Believe me, they won't look down on you, and they'll be able to relate to you a lot better which will improve your relationships with them, and in turn the group dynamics. Talk about your experiences in the class, where you had trouble and what helped you out, because

they need to know that you're a normal person. Laughing and being lighthearted helps as well, especially when the frustration levels are high.

Another important consideration for creating a good community environment is flexibility. Just as you expect the students to be patient and responsive to one another's needs, you need to do the same. If they seem confused, don't just rush into the problems – take a few minutes in the beginning to go over equations and concepts to make sure everyone is on the same page and has a good foundation. PLTL may seem to have strict regulations and methods, but with some creativity there are ways to personalize your sessions while staying within the framework.

Overall, my advice would be to have fun with PLTL and make it your own. Get to know your students – send them weekly e-mails letting them know what topics you'll be covering that weekend, wish them luck on an upcoming test, or stop and chat when you see them on campus. If you learn about your students and what works for your group, the experience will be much more positive for everyone, and the community you build will be significantly stronger.

Creating a Covalent Community

by Jordan Arakawa

Going into my first year as a PLTL leader, I had many doubts about my understanding of the material that I would soon be guiding others through. This thought was very unsettling as I wanted the students to gain the best experience that they could from participating in a study group. As I read through the book made for us by last year's leaders, I began to worry that I would jump in and correct mistakes too quickly, or that I would not know the answers to all of their questions. However, after a session or two, I came to realize that the best way for me to provide the students with a rewarding experience was to not only help them with chemistry, but also, to bring them together as a group. Making everybody feel comfortable and relaxed is a very important aspect of PLTL. When people are comfortable with their peers, they are more apt to speak up if, for instance, they do not understand a concept, or if they feel that the solution is incorrect. Instead of having eight or nine individuals come to PLTL every week and learn for themselves, I wanted those students to work together so that everybody felt comfortable with working in the group and so that, by the end of each session, everybody was on the same page with regards to the chemistry material.

There are many methods by which a PLTL leader can bring that level of comfort to his or her group. Firstly, know that there will be disagreements and tensions that develop within the group. If there are none, your group may not be progressing as you think it is. As a facilitator, it is your job to resolve these conflicts quietly and civilly with the relevant group members. Ignoring the problem and hoping it will go away will only make it worse because, in my experience, the person causing the problem will not always realize that their behavior is irritating to another member.

As a PLTL leader, it is also your responsibility to make the students feel comfortable asking questions. You must realize that not all students learn the same way. Even though all your students are in Chemistry 111, some may be better visual learners, needing pictures, while others may be keener on equations or verbal explanations. For example, if you jet through a problem with most of the group using equations, the visual

learner will be left out. However, because the problem was done so quickly and with such ease by others, this lone individual will feel stupid, and not ask for an explanation.

As the group progresses, you must see these preferences and tailor your delivery to them. Make sure, however, to pull your students out of their respective boxes and make them learn in different methods because in doing so, they will learn the concepts better. Consequently, they will feel more at ease speaking up in PLTL.

Finally, as a PLTL leader, you must be conscious of your language in PLTL. As Dr. Frey said to us in a SAM class, we are employees of Washington University. Therefore, as PLTL leaders, we must be mindful of the level of diversity at the school. Any stereotypes of race, ethnicity, and gender should be thrown out at the door. When a PLTL leader looks at his or her group, they should see people of various learning styles and backgrounds. However, they should not let these observations influence their treatment of group members.

Leading the Transformation

by Saranya Bala

The first PLTL meeting was both exciting and interesting. In those two hours of the first session, I remember being observant of every student's personality and wondering what role they would take on as time progressed and as our group developed. Right away the differences within each member became obvious. After the icebreakers, the students did not socialize with one another and everyone remained focused and quiet. Furthermore, all of the students were seemingly confused by why PLTL was not more like a tutorial session and it seemed like all of them doubted how PLTL would eventually help them succeed. They constantly looked to me for the answer because they were unfamiliar with one another. I remember having similar worries of how the students would benefit if every session were as quiet and stoic as the first.

As time passed, it was noticeable that everyone, including me, was more comfortable with one another. Furthermore, the students finally began to accept the fact that I would not be their answer key, and thus they were forced to turn to one another. Through their interactions, I was able to observe a transformation from an impersonal setting to an enjoyable and valuable learning environment. It became obvious that every student had their own unique learning style, and it also became obvious that this was an advantage for the group. Some students liked to work through the problems with visual aids on the board, while others felt more comfortable explaining their thought process verbally. Each session was an opportunity to learn to solve a problem in a unique manner, and thus, remember the concepts in a different way that may make more sense.

For this process to occur, I think it was essential that I maintained the role of being the encourager and the observer. It was important that I observed the group dynamic and paid attention to every student's contributions so that I could encourage the quieter students and pacify the boisterous ones. However, I quickly learned that it was equally important for me to remain an observer that could simply guide and encourage the students to finding their own answer. As time passed, it became noticeable how each student was uniquely contributing to the overall group dynamic. Every student contributed to the group equally, yet differently. I noticed this when a certain student

would be absent, and I could feel how the group dynamic would be slightly modified for that session to make up for their absence.

I definitely found myself enjoying the time I spent with my PLTL students during the session and they would always tell me that they felt the sessions were not only beneficial, but also enjoyable. The students would work together every week with others who were in the same situation as them, and through this interaction and peer-led learning, they realized that the subject they were a little intimidated by was not so bad after all. One of the most rewarding aspects of being a leader is watching the dynamic of a group progress and transform, and being able to see that your students are not only gaining a more solid understanding of the subject matter, but also gaining confidence and making social connections that they may not have made otherwise.

Bonding and Integration: Creating a Covalent Community

by Erik Carl

One of the hardest tasks as a PLTL leader is encouraging teamwork, and collaboration with peers. Many of the students who participate in PLTL are incoming freshman, taking their first college science course and thus going through a stressful period. Natural reactions to these circumstances within a study group such as PLTL includes becoming terse toward peers, losing sight of the group's main focus, and viewing the group as a source to be used rather than replenished. All of these reactions are typical and must be dealt with by the leader. If carried out correctly, the techniques utilized and the philosophy set forth by PLTL ultimately makes evident the advantages of cooperation and creates an atmosphere that is conducive to sharing ideas and questions. Of course creating such a harmonized community takes time and effort.

As a leader, my first PLTL session created a false impression of the group dynamic. All of the students, for the most part, seemed courteous and respectful toward one another. Creating discussion among the shy students was perhaps my most difficult task. What I saw during this meeting led me to believe that moderating this study group would not present any problems, and that everything would run smoothly throughout the duration of the semester. I had no foresight of some of the future difficulties to be encountered as a leader.

The meeting preceding the first exam provided the initial indications of possible troubles in creating a positive learning environment for the students. Many of the students expressed frustration with their work load, and the material that they needed to study before test time. This frustration led toward self-survival attitudes made apparent in the lack of discussion during pair work, and the skeptical feelings in waiting for everyone to arrive upon a reasonable understanding of the given problem before continuing onto the next one.

Suggested techniques for moderating PLTL study groups is what ultimately saved the situation. Exercises that forced cooperation among students effectively allowed the students to see the advantages of working together. Such exercises included having one person act as scribe during small group work, and randomly calling upon students to

work out a portion of a problem during round robin. Applying the PLTL procedures for solving problems provided a template that encouraged interaction between the students which in turn marked the advantages of working together.

Slowly but surely, during the course of the semester, the students began to recognize the advantages of working together. I credit the problem-solving methods of PLTL for making apparent the advantages of such cooperative work. Realizing that an atmosphere of kinship rather than self interest in study groups is more beneficiary may be one of the most important lessons learned from PLTL. In addition to supporting the students in their trials and tribulations with regard to their studies, PLTL laid the foundation for quite possibly all future study groups that these students may participate in. Study groups that will hopefully not have to endure the painful process of creating a covalent bond among its members.

PLTL: A Work in Progress

by Liz Dabrowski

Although PLTL has been around for awhile, it is still a work in progress. Every group is different and I had to learn to tailor the PLTL experience to my group. The approach I took this semester could be completely different from that of next semester, because everyone has different abilities and learning styles, and you have to run your group so that everyone gets a better understanding of chemistry. What had worked for other groups did not always work for mine, so I constantly changed the way I did things until I found the most beneficial and productive method of facilitating my group

Initially, I tried to interfere with what the students were doing. If I thought they were headed in the wrong direction, I would stop them and ask questions to get them to do the problem my way. Needless to say, this did not help the group. There are many ways to do the problems, and even if someone is doing it the “long way,” let them do it. I find that sometimes students understand the “long” way better, and even if they don’t, they now have multiple ways of doing similar problems. In addition, I find it is better to let the group discuss uncertainties than jumping in and clearing them up right away. Even though it can become frustrating, when they work out their own problems or incorrect concepts, they understand the concept better, because it is put in a way they understand rather than having someone with more knowledge explain it, usually making it more complicated.

One important thing I discovered is the need to adjust the problem solving methods to fit my group. They didn’t do well in groups, no one worked together, it was just each of them doing the problem on their own and comparing, inevitably it took longer to find incorrect steps and someone ended up lost. Therefore, when they were supposed to be in small groups, sometimes I used the “group chaos method” where they all worked together on the problem if it was particularly hard. Another way is to assign roles within the small groups. Just have one person put the solution on the board and the other one or two explain the work. This forces the students to work together, and either writing the problem or explaining it means they have to possess some understanding of what they did.

Another problem many of us ran into was with round robin and scribe. Students would work ahead and figure out which round robin problem would be theirs they weren't put on the spot when they couldn't spit out the answer right away. To prevent them from working ahead, I skipped around the table with round robbing so no one would know when it would be their turn, making working ahead pointless. Also, with scribe, it usually ended up that either the scribe or one person in the group did the entire problem. To fix this, I did the scribing and I went around the group round-robin style, having someone different tell me each step.

Overall, I think I changed a lot to make the learning experience more beneficial to members of my group. But, there are always things that need changing and more thought that could be put into making my group better for everyone.

Creating the “Perfect” Environment

by Hreem Dave

At the first session, I was overwhelmed by the nine brand new faces surrounding me. They seemed apprehensive about what the session was going to be about, but at the same time they seemed eager to begin. We began the session with simple introductions by going around the room. However, as I watched them go around the room, it was already evident that they were going to have trouble working as a group. It wasn't that they weren't amazing individuals, but it was clear that each one of them had very different styles. Some of them were timid while others were more outgoing which is a phenomenon that is true in any setting. However, I felt that in this group setting where everyone is encouraged to become cohesive, it would be harder to mesh the various styles.

My assessment proved to be correct since throughout the semester we had difficulty working together as a group. There would always be one or two people who enjoyed to converse with their neighbor about stuff other than Chemistry. This prevented the whole group from focusing on the problem being discussed and they often had to ask many questions at the end in order to “catch up” to those that had been listening. In order to prevent this from happening continuously, I decided to pair people up in different ways when they were working on problems. This forced them to work with those people whom they had never spoken to and it also minimized side conversations. Furthermore, the interactions that those people had allowed them to become more comfortable with each other.

After the group became comfortable with each other, they began to “come out of their shells”. They started adding their input to the discussion even if they were not completely sure about their answer which proved to be crucial for the development of the group. Furthermore, some students who had previously been very quiet and seemed to be “lost” began to add in important details to difficult concepts. I feel that the main reason that they were able to do this was because of the environment that had been created by the other members of the group. They had begun to feel that their opinions also mattered and therefore they should not be afraid to voice them. Also, they began to realize that the

group would not look down upon them if they did not understand something, but would instead help them out with the problem.

Throughout the course of the semester, the group began to get along better and better. Each time, they seemed a little bit happier with the fact that they had to spend two hours doing Chemistry problems. At the last session, they were actually somewhat sad not to have another PLTL together. They had finally become a group primarily since they had a comfortable and relaxed environment to work in. Without this, the group would not have come together so efficiently, therefore, it is crucial to create this environment for the group to work well together.

Creating a Strong, Productive Group

by Kathleen DiSanto

I remember walking into my first PLTL session as a group leader. I was insanely early because I wanted to make sure that the students didn't arrive without seeing me there already. I was so nervous that the students would not take me seriously and that I would have trouble guiding the group without falling into the role of teacher or tutor. It was very intimidating being in a room with nine students I had never met before. You don't know how receptive they will be to the methods of the group. You don't know if they are eager to learn. But the one thing I was most worried about was that I did not know if I would be able to help them further understand chemistry by being the best leader I could. Each week I became more and more accustomed to the members of the group, and I became more aware of the way in which each student worked.

I think the best piece of advice that I can offer to future PLTL leaders is to make sure that you establish a feeling of comfort during the group sessions. The students always work better when they are comfortable with the people around them. The first few sessions were awkward and very quiet. Each student became very nervous when it was their turn to answer a question or do a problem. It took a few sessions in order for the students to become comfortable enough to volunteer answers to questions without me having to ask questions directly to certain people to try to encourage each student to participate.

One way in which you can help the students become more comfortable is by talking to each of them. I always arrived a little bit early to each session because certain students arrive early as well. I always tried to chat with each student to get a feel for who they are, what they like to do, and maybe whether or not they are struggling with a certain aspect of chemistry. By the end of the first few weeks, I had talked to each student one-on-one at least a few times very casually. This definitely helped them relax. I also made sure that any time I saw them outside the group sessions I would say hi to them. I know this may seem insignificant, but it really helped the students relax.

Another way to make the group more of a community is to allow the students to talk to each other. At the beginning of the session I would always let the students talk to

each other for a few minutes before we would get started. Then in the middle of the sessions, I would let the students go off topic for a little while just to give them a bit of a break and allow them to become more comfortable with each other.

This feeling of ease and relaxation that developed gradually throughout the semester really helped the students learn more effectively. The group was very productive. They paid attention to each other, and helped those members that struggled with certain topics or concepts. Because the members really got to know each other, they were very considerate of each other, and that is one of the qualities I valued most.

Creating a Covalent Community

by Elizabeth Gagnon

Forming a cohesive group is arguably the most important goal of PLTL. Without such a group it is impossible to reap the benefits of group learning and will make each session a struggle to successfully get through. Developing a cohesive group is not hard to accomplish as long as you as the leader are aware, involved, and open. Here are some things to keep in mind as you begin to mold your group into a cohesive unit.

Inevitably your group will be composed of very different individuals. You will have the quiet ones, the vocal ones, the ones who understand the material like it's the back of their hands, and the ones who are completely lost. These individuals could alternate roles each week or stay consistent. Either way, the most important thing is to make sure that everyone is comfortable in the group. Watch for someone who cuts everyone else off before they finish their thought or for the one who does not talk much and when it is their turn in round robin prefaces their response with "I don't really understand this material" or "I don't know, but maybe..."

In the first case the individual needs to realize that other members will become irritated if they are consistently cut off. To alleviate this, you can remind the group to let everyone finish their thoughts before adding their own or that during robin round, for example, it is only one person's turn at a time and he or she should be the only one talking. When it comes to the quiet ones or the ones who lack confidence in their abilities, you should build up their confidence by asking them questions you know they can answer, so that they will slowly become more comfortable in their usefulness in the group. Lastly, they might say something correct, but may not be heard among other members. You can casually suggest that "so-and-so had a good point" or "let's listen to what so-and-so thinks." Building confidence and making the group a comfortable place are great ways to get everyone in the group active.

Another thing to keep in mind is that at first the group sessions will probably be pretty awkward because no one knows each other or how PLTL works in general. It is best to be persistent and to not get frustrated. For example, in the beginning my group only really worked well using round robin; pairs or small groups would lead individuals

to work by themselves or have one person control the whole pair or group. As the semester progressed, however, and the group members became more comfortable in the session, pairs and small groups became very effective methods for us to use during the problem sets.

Finally, although this is probably the hardest thing, it is critical not to become the answer key. As a leader if you give the group answers or tell them after every step whether they are correct or not, they will become very dependent on you and this will halt the progression of the group. The group will not have to focus on working cohesively to get the answers and methods on their own, instead they will know that even if they cannot agree that you will lead them down the correct path.

Forming a cohesive group takes patience and time, but once it is achieved it will make PLTL sessions run much more smoothly and successfully for the group members as well as for you.

Creating a Covalent Community

by Rena Goodman

Being a PLTL leader is both a challenging and a rewarding experience. You might expect that both the most challenging and rewarding parts are in watching the students solve the problems, in not being able to tell them the answers, and in having to hold yourself back from teaching things to them. Although those things were certainly both challenging and rewarding, in the end, I might actually argue differently. I think that the part of being a PLTL leader that was perhaps both the most challenging and the most rewarding was in watching and encouraging the development of the PLTL group as a team that learned to work together, and as a community.

The first couple weeks were crucial in forming the community within the PLTL group; the students got to know one another, started to get a feel for each other's personalities, strengths and weaknesses. Before the semester began, I hadn't really thought much about how the group would evolve, and how the dynamic would form, much less how I would be able to influence it. I was glad to see, from the beginning, that the members of my group seemed to get along well, to encourage each other, and to be willing to answer each other's questions. Little did I know that the task of forming the community was just beginning.

My first instinct was to let the group form on its own, to stand back and let them work together with as little help from me as possible, to encourage them to depend on each other, rather than on me. However, I soon realized that I needed to do a lot more. When I stood back, the group would sometimes discuss in circles, unable to agree; as the semester progressed, and busy weeks came along, full of exams, students were less likely to participate without prompting. Although at first it was frustrating when the students were not as active as they had been the first couple weeks, I realized that that was to be expected, and that I would just have to adjust and improve my style as a leader.

Throughout the semester, every week was a little bit different. Sometimes I had exams, sometimes one or more of the students in the group had exams, sometimes we all had exams, or papers, or just a lot of other studying to do. However, as the leader, I would put aside thoughts of all the work I needed to do, and would try to be as

enthusiastic as possible. The students also helped each other, rarely criticizing, usually just offering advice or alternate methods of solving a problem. Sometimes, when I felt like we were taking too long, I would become too hasty, asking questions to clarify things that others were already going to explain—it was just part of the learning process for me, as the leader, to find the best ways to encourage the development and cohesiveness of the group.

As each week passed and I tried different methods of encouraging the group, I realized something that had not fully occurred to me at the beginning: I was as much a member of the team that made up the PLTL group as any of the students involved in solving the problems. My job as a member of that team was to guide the group, to direct them, to make sure that we didn't spend too much time on any one problem, so that we could finish the problems. It wasn't easy; directing the group without actually teaching them took practice, as well as experimenting with different methods. But as I learned to be a better leader, it seemed to me that the students learned more, too.

Bonding and Integration: Creating a Covalent Community

by Emily Hessler

At the last PLTL session for the semester, if an outsider were to view my group, they would suspect that each member was friends at the onset and knew how to work well together to solve the Calculus problems without relying on me for the answers. However, the group did not start out in this manner. The group developed over many sessions of learning together and adapting to each member's learning style and habits. Many students do not know the exact philosophy of PLTL coming into the group and have no idea what to expect. The final product starts with only a handful of students and a nervous leader and a couple Calculus problems. Creating a covalent community is up to the leader and the group's interactions.

So how do I think the group developed? One of the most important things is that from the beginning we established a mutual respect for each member of the group. Respect is essential and entails many aspects. First, each member has an equal say and deserves to be listened to by the other members. Additionally, each member deserves respect no matter what gender, ethnicity, age, or background. This last point is especially important as a leader. The students will take cues from you and if you seem to prefer someone over another member or not listen to a member's view, then other students will pick up on that possibly losing respect for them as well and even losing respect for you as a leader. Allow your group to define their own rules and what it means to be respectful, which can include being prepared by coming on time with the necessary materials and going to class and doing the homework. Equally important is getting to know the members of the group and caring about them. For example, if someone is absent, ask him or her why and reinforce how important he or she is to the functioning of the group. Know everyone's names and say hello when you see them around campus. Be aware of when important quizzes or tests are coming up in order to wish them luck and later, ask how it went. Make sure each person in the group also knows each other. Students may be intimidated at first to go up to the board or express an idea. Providing a comfortable environment in which everyone's ideas are respected, even if wrong, and in which everyone participates, enables hesitant students to overcome this anxiety. If members are

still reluctant to participate, implement the PLTL methods and switch things up a bit. For example one of the best ways I have discovered to promote participation is by doing pairs for problems with multiple parts and assigning each pair to a part. Next, the pairs switch partners and each must present the problem he or she did with the previous partner. This method ensures that each member comprehends the problem and that one student is not dominating because each person must explain based on his or her own understanding. Additionally, the more intimate nature enables those students who are shy to discuss the problem with a smaller group, but still participate fully. As time passes, the group will get to know each other very well and hopefully feel very comfortable with doing problems with each other. This method helped my group dynamics greatly. Getting to know the students will also help you as a leader to learn and integrate each of the members learning styles. The PLTL methods help, but it is also important that when explanation is needed that many learning styles are incorporated. For example, if we are defining a concept, have each member describe it in their own way, possibly with a picture, or an equation, or in words, or even with a real life example. Help the students rely on each other as resources and not look to you for the answers. Each person's learning style and personality is not apparent from day one and the person who is confused the first week may be different the second. With experience on both your part and the group, the dynamics will develop into the type of group I saw within my last few sessions.

In summary, every group is different and will develop at its own pace. No group will start out perfectly, thus the group and leader must work together to create a stable and comfortable environment in which the students respect each other. The students will get to know each other and then integrate every individual's learning style and thoughts towards the goal of working as a group to achieve understanding in how to approach and solve problems.

The Magic of PLTL

by David Horton

With so many distractions and diversions in a session, leading a group can be daunting. It doesn't seem so tricky at first, but there is a lot going on. Students make mistakes, some work ahead, others fall behind, and you must be on your toes enough to catch every incident. A leader must create a friendly atmosphere but simultaneously make sure every member understand the intricacies of each problem, all the while trying to not even hint if they are right or wrong. There is so much going on, so many sideshows, so much chaos sometimes, the only solution is to become the ring leader of craziest circus learning has ever seen.

Juggling so many tasks at once has proven most difficult for me. Occasionally, the group will work on a problem in dead silence, but even then there is just as much happening and just as much attention required as when every member of the group is talking at once. Remember that there will never be a moment when none of your students might be confused, so always keep an eye peeled. Similarly, it takes skill to simultaneously remember baffling concepts from a year ago and ascertain precisely what a student is confused about. Practice and plenty of preparation help. But once again an effective leader must merge talents by adding the art of explanation to the simple regurgitation of information. The transition must be made from simply throwing balls into the air to juggling flaming chainsaws. It is a performance, where the auditory and visual senses alike must be excited to dazzle the crowd.

Up on the tight rope, the leader must balance between the functions of a passive guide and a source of information. The central pillar of PLTL philosophy is the absence of an answer key. However, at times the group is so desperate for help that even leading questions fail to alleviate confusion. It is easy to waste time with the group struggling to a simple conclusion, but an answer told is not as easily remember as an answer self discovered. A keen leader can recognize which route certain situations call for, and when he or she is deviating from such a dizzying path.

All in all, the leader must be a side act. Although bearing the responsibility of the whole show, the members of the group are the main attraction. The leader's talents as a

magician must allow for active involvement one moment, and then disappearance in the next. 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. Ideally the magician appears to the audience as little as possible, but in some situations it is unavoidable. Questions serve the leader as a magician's wand. They are the source of all his power and wonder. I dare you to overuse questions. Even if a student understands every complexity of a concept, it might be forgotten the next day. Ask for an explanation and the understanding will surely last longer. Ask a confused group to explain what they *do* know about a problem and watch to your amazement as they discover they know more than they thought. Ask, ask, ask, but rarely tell. Telling is a magician's smoke screen which is only a last resort.

The circus is meant to be memorable, and it is meant to be enjoyed. Anyone with an A in their subject and a year of participation in a PLTL can lead a group, but to inspire the group, to give them not only an understanding but an interest in the material, and to have fun the whole way through, is the magic of peer led team learning.

Bonding and Integration: Teamwork and the Evolution of the PLTL Group

by Vijan Joshi

Even though I had experienced the PLTL program for myself as a chemistry student, I wasn't confident that I could actually apply the method as a leader and be successful. I wasn't very confident of my calculus skills and was apprehensive about being asked questions I couldn't answer. I doubted my leadership skills from the very beginning and thought my students would hate me and that my group would fall apart. After all, if I wasn't able to give them answers or "tutor" them, what good was I to them anyways? I had visions of my students rising up in protest and rioting against the PLTL method. I would single-handedly bring about the downfall of the entire math department.

After I was done predicting doom, it was time for my first meeting with my group. What I found surprising is that people are willing to try the PLTL method instead of immediately distrusting it. Throughout the first meeting, there were questions about the various methods we used and about my inability to simply give them answers; however, after the first two or so meetings my group began to accept most of the methods we used.

One of the most interesting aspects of my PLTL experience was watching my group develop over the course of the semester. At the first meeting, everyone was somewhat reserved and unwilling to participate. Since most of my students had never met before, there was an initial time period where the group members were very uncomfortable with not knowing an answer to a question since they did not want to seem unintelligent in front of their peers. I feel that this is one of the most important transitions a study group goes through. Once students are willing to make mistakes, the process of peer learning can begin. An important lesson I learned from being a peer leader is to simply be patient and allow your students the time necessary to develop into efficient learners.

Once the group members are comfortable with one another, they will be better able to work cooperatively with one another. The comfortable environment established may prove to be almost as problematic as the new group environment, however. Once familiarity has been established within a group, distractions may arise through side

conversations. This should be expected since it's one thing to sit around and solve math and science problems with strangers while it's quite another to force yourself to do these problems with people you have come to like. My group in particular reached this stage fairly quickly as all of my students seemed to get along right away. My advice to future leaders who encounter this situation is to make sure you maintain an academic atmosphere within your group and not let meetings become social events. PLTL can definitely be fun, but it should always be centered around the goal of developing proper learning skills.

Eventually, the group members will find a happy medium between their desire to be social in the group and their desire to learn. This evolution is part of the learning process of PLTL. Throughout life, teamwork is an important skill to develop and it is one that the PLTL model relies upon heavily. The role of the leader is to facilitate the creation and development of this team. While showing students a better way to learn may be the main goal of PLTL, a leader must realize that there are other lessons that PLTL can teach as well and a good leader is able to show his or her group all of these lessons.

Letting the Students Make Your Group Work

by David Long

The day I received the email that I had been accepted as a PLTL leader was exciting for me. But the following semester when I realized that I would actually be leading a group of students every week was quite daunting. I didn't know how I would handle interacting with my group. My biggest worry was that my kids would know a lot more than me, and they would lose all respect for me on the first day after I couldn't answer a complex question one of them asked. After dealing with my kids this entire semester I realize that what they really needed was a student they could relate to who had already suffered through general chemistry, not some chemistry god who knew everything.

My first week with my group went really well. I brought candy for them and we all got to know each other and I came out of the session feeling like I had passed my first test as a PLTL leader. I didn't realize that everything wouldn't go perfect from that point on. The next week it seemed as if all the progress that my group had made on the first day had been undone. My group didn't communicate well with one another and it seemed as if everyone was disinterested in being there. This had me really worried because I didn't know what I was doing wrong. The SAM class gave me a lot of ideas on how to help my group interact better with one another. Going to SAM every Tuesday is an invaluable resource because if there is a problem in your group there is always another leader who had to deal with that problem or who has ideas on how to solve it.

Over the course of the semester, the students became much more social with one another and interaction as a group definitely improved. Allowing the group to become sidetracked from time to time is not extremely detrimental to the goal of why they are all there. It helps the students to become more comfortable around one another and with you as the leader. Even though it is important for the students to see you as a leader to the group, being social with the group during the session and speaking to them outside of PLTL about things other than chemistry is essential. The sessions will go much more smoothly for you and the students if all of you enjoy the two hours that you will have to be together every Sunday.

Building your students' confidence is another way to make the group work together more efficiently. One of my students was always unsure of herself and never wanted to go to the board or answer questions. It took a few weeks to coax her into confidently going to the board and writing her answer up there. 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. I also had students who were very vocal and quite confident in their abilities in general chemistry. Using these students to explain difficult concepts to other students is the approach you may want to take before trying to explain it yourself. I always found that the students had different ways of looking at the problem than me and their ways were sometimes what the other students needed to hear to clarify a concept. Use your students as resources. View them all as potential sources of information because even though they may not think they understand, they just might and when students help each other, the group dynamics become much better.

Covalently Bonded Atoms

by Kelly MacArthur

I walked into the Lab Sciences room that first Sunday uneasy and nervous. Paranoid, I gripped the PLTL problem sheets for the session, so that my nightmare the preceding night: that I would show up completely unprepared, would not come true. I had an unfounded feeling of being unprepared as each student entered the room because at the hour I had nine quiet, timid-looking students. I finally understood that day just why they call it an icebreaker; people are motionless, wordless until such an activity stirs people and actually begins group dynamic. As we began the first problem, my worries partially subsided but transformed to a fear of striking the balance in facilitating but not tutoring, leading but not overpowering, overseeing but not letting the group stray. The only thought running through my head was that of not being afraid to say “I do not know” when asked a question, because it is so important that other students step in to explain concepts to one another. Therefore, the first question was asked, and in a loud declaration I belted out “I do not know.” A little confused and puzzled, the students looked around at each other. I believe that while a mistake, this awkward proclamation truly began the group formation and growth. Students finally looked around at one another and began posing questions to each other. As much preparation that I had for that first session of PLTL, I had not truly understood the term “facilitator” until such a statement was announced to my group. They slowly but eventually, in the weeks to follow, stopped turning to me for their questions and began finding at least one other person to ask their questions and seek explanations when their understanding failed. They stopped looking to me as a tutor, and this greatly helped me to find that balance in leading PLTL groups. While it was very difficult and often painful to watch a student begin a problem incorrectly, unable to stop him/her in his/her tracks, I began to see such a benefit of giving the students their independence in catching their own mistakes. Likewise, a few students took longer to channel their energy into the group dynamic, as they seemed to prefer working alone on problems. I learned to pull them into the group, pushing them beyond their levels of comfort, so that they would talk to their partner when pairs was the method to solve the problem, or call on them to go to the board despite the fact that I

noticed they did not seem to understand the material. While bonding, interacting with and integrating the group were definite goals to attain in leading the PLTL sessions, I consistently reminded myself that while students should be pulled into working in groups, pairs and as a whole, it is likewise important that they enhance their abilities to work individually as well. I often found round robin to be beneficial to such individual learning. Frequently, when I noticed certain students did not seem to understand as well as others, and were being overpowered in pairs and small groups, I switched to round robin. As uncomfortable as it was for them to go up to the board, round robin always guaranteed that they would understand the material by the time they sat back down in their seat.

Learning to lead a PLTL group consists essentially of understanding how to enhance the interactions of a covalently bonded atom. This past semester taught me how to keep my students close, so that we stayed on track and worked as a group, while helping and encouraging them to think independently. PLTL was about keeping the members of the group bonded and integrated together, but at the same time allowing them their freedom to think for themselves, and giving them that permission to stray from the group so as to bring in new methods of looking at and solving a problem. The PLTL group gave them a structure in which to work, all the while granting independence to move in such confines, resembling that of covalently bonded atoms.

Having Fun While Studying Hard

by Chris Markham

As is the case with most social interactions in life, PLTL is all about starting off on the right foot. Not to give any added pressure, but the first session of PLTL is the most important session all year. This isn't to say that a poor first session is unsalvageable, but how you run the first meeting with your peers is a critical indicator of how the rest of the sessions with your group will develop. I feel that building a productive group requires that the first meeting should establish a friendly community. In order to communicate this ideal of warmth, it is important to start the first session with a solid icebreaker and explanation of ground rules as well as a personal touch that tells the group something about yourself.

It is my belief that the icebreakers that are given out at the beginning of the year can be described as "bleh." These are good general icebreakers, but it's more fun to come up with your own (personalized) method for getting everyone introduced to each other. An example of this could be creating a list of four or five questions and having each student answer them. Fun questions such as: "Who is your favorite superhero and supervillian? Who would win if the two fought?" or "If you were an element, what element would you be?" (for the chemistry leaders out there) help to set a light-hearted tone, but still establish that the purpose of the group is to study.

Additionally, it is extremely important to establish a set of ground rules for your group. As you probably know by now, it is important to go over the philosophy of PLTL and what it means to be in a PLTL study group. This is not enough, though, and that is why establishing a set of ground rules is a good idea; make sure to spend an adequate amount of time setting some basic rules. Ground rules bring everyone's concept of group dynamics together and establishing ground rules is a nice way to start the group working together on a problem (this way they don't dive right into the academic side of things). One method that might work particularly well is to have the group break up into small groups (of two or three) and ask them to come up with a list of two or three ground rules that they believe help group work run smoothly. Bring everyone together again and have

each group present their rules with an explanation of each rule. Make sure to write down the ground rules and perhaps print out a copy to give to everyone at the next meeting.

On a more exciting note, the last thing that is important for creating a strong group early in the year (and this doesn't necessarily have to be during the first meeting, although that would help) is to add something personal to your group; be creative with this one! If nothing comes to mind, try thinking about what makes studying more enjoyable for you, and then trying to incorporate that into your group session. Perhaps you could bring in some easy listening or classical music to play (it is important to make sure and ask your group if this is okay before you do this one). I'm sure there are a variety of interests among the leaders, which means each group can be a fun, unique experience for each of the students.

Whatever you might choose to do to foster a strong community in your groups, remember that each of you have been chosen at least in part because you are integral parts of the Wash U community; it should be no problem extending your participation in that community to the concept of creating a community for your group. Remember that, in the end, it's all about having a good time and sharing your love for the subject matter with the students.

No Matter What the Size

by Hana Nyklova

My experiences from being in a chemistry PLTL group as a freshman gave me what I thought was a very good picture of what all groups would be like. I thought that everyone would show up every week, be prepared, work hard, ask questions, and try to work with everyone in the group to figure out the problems. However, this was not the case with my calculus group this semester. I still remember the first PLTL session of the semester that I led. I arrived in the room a few minutes early, had time to set up, and was ready with confidence to begin when students would start wandering in. Starting with day one, the students that did show up came in late and were not willing to put much effort into group work. I thought that the group was just having a rough start and after explaining the PLTL philosophy and procedures, I thought that by next week, everything would be great. Much to my disappointment, the attendance did not improve by next week, and it only got worse. Throughout the semester, only three students were consistently showing up, with three dropping out completely without telling me and another who came irregularly.

Attendance has been one of the biggest challenges for my group. I think that it has kept them from really bonding together, knowing each other, and working together effectively. It has been a challenge trying to create good group dynamics, but I have learned a couple of tricks over the semester. First, it is really important to be patient and try to put yourself in their shoes. Try to remember what it was like learning that material and how confused you were the first time you were learning it. When you have only a few members in a group, not one of them might have any idea how to even start a problem, then it is up to the leader to ask the right questions and lead the group to the right idea without lecturing.

Also, try to create a warm and friendly environment. Our calculus group met every Saturday morning at eleven and most of the members were rolling straight out of bed, dragging themselves to do calculus after a night of partying. I realized that they were usually hungry and sleepy, so I started bringing in candy or cookies to get them going. It

seemed to give them energy in the morning, and it really seemed to lift up their spirits. The group really seemed to appreciate these little rewards.

Lastly, do not give into their demands by giving them the answers. Even at the end of the semester, my group would still ask me if a problem was correct. Though every week and all semester, I have told them that I am not the answer key and will not tell them how to do a problem. By holding up the PLTL philosophy and not telling them the answers, the group learns more than they might think at the time. They may be frustrated that they really do not know if an answer is correct, but they will learn to be confident and check their work. By checking their work and reviewing the steps of a problem, they realize that they made a mistake, which helps them understand each step and focus on the process of a problem, not just the result.

Each leader faces different challenges with every group, but you cannot know what to expect until you meet your group. It is important to stay confident and positive throughout the semester and try to create a positive group atmosphere.

Creating a Covalent Community without a Community

by Alexandra Penn

Before my first group meeting I was so nervous. I knew that my primary job as a peer leader would be to help the students interact with each other, creating a strong community in which they could learn and grow as physics students. But what if I couldn't do that job? What if one student was really smart, and made everyone else afraid to talk? What if one student was shy and quiet and didn't ever want to answer questions? What if one of my students never went to class and never studied and slowed the progress of the other students? What if two of my students hated each other and started fighting? The possibilities for disaster were endless. Fortunately, within a few meetings I discovered that my most extreme fears were unfounded. Some students were better with the material than others, some students were more outgoing than others, and some students would become frustrated with each other and have small disagreements. But none of these problems were insurmountable, and I felt confident that by the end of the semester we would have a strong group dynamic. What I didn't realize was that by the end of the semester, I would barely have a group.

Throughout the semester several students quit PLTL because of time concerns or because they were dropping physics. The remaining students seemed to get discouraged and pessimistic as the semester dragged on, and they often missed sessions because they wanted to use the time to study for other tests. At some meetings, five or fewer students were present, and they seemed very discouraged by the lack of attendance. I could practically hear them thinking, "If other people are skipping to study for tests, why shouldn't I? I have a lot of work to do too." Even I became discouraged. Frankly, I had a lot on my plate, and there were many Tuesdays when I would rather have been studying than helping a group of undedicated students. The group dynamic that I had once been sure I could build was impossible, because the same students did not attend each week, and the students who did attend were too frustrated to work productively.

Eventually I realized that I could not let the attitude of the students affect me. I was the one who needed to bring a good attitude to the sessions, and I was the one who could coerce and persuade and threaten the students until they started attending the

meetings regularly. I started coming into the sessions with a bright smile, even if there were only four people there, and instead of commenting on how upset I was about the missing students, I would dive into the problems with an upbeat attitude. I enlivened the sessions by occasionally bringing candy or food and telling the students they could thank me by working hard on the problems that day. I thought of funny stories and examples I could talk about that would help the students understand the problems. Before the second test, I prepared a review sheet that would help them study, but told them they had to come to the meeting that week to get it. I emphasized how similar the PLTL problems were to some of the test questions, so they would realize that coming to the meetings each week could have a big effect on their physics grade.

Over the next few weeks, students started coming with increased regularity. Because the students attended the sessions regularly and came with good attitudes, they were more productive and seemed to get more out of the problem sets. All of my students were higher above the mean on the second test than they had been on the first test. In the last month of PLTL, most of the students were at every session, and at every session they worked well together: they were more positive, listened to each others ideas, and learned more from the problem sets than they had in the past.

At the beginning of the semester, I had been worried about building a strong group dynamic. I was worried about all the different types of “problem” students that might be in my group, but I never thought that attendance would be the biggest bar to group success. By the end of the semester, however, I was able to pull my group together by convincing them to attend the meetings and to bring good attitudes with them. My students were able to learn more about physics, and I was able to learn more about group dynamics: if you want students to show up, you have to give them a reason to be there.

Bonding: Willingness to Share

by Jane Ratner

My experience this semester was everything I had hoped it would be and more. I was excited for the sessions to begin, but also figured that my enthusiasm about leading would taper off as time went on. I did not expect to be more and more excited to attend my group sessions each week. I do not feel that my experience with my groups would have been as good, had I not initially made the workshops a place and time for sharing and openness. I also do not feel that the groups would have been as cohesive and cooperative during the sessions without this open atmosphere.

The first and most obvious thing that got our group dynamic working was (believe it or not) the icebreaker in the first session. I chose to do the exercise where everyone says three statements about themselves; one is a lie and the other two are the truth. This icebreaker could have been like any other, but I made a point to comment on each person's statements to get to know them better and be enthusiastic throughout it. My group also began to interact immediately by asking other members questions as well about their statements. I found that in my groups, even during that first day, I did not face the problem of my group members not communicating while solving the problem set; the members wanted to work together and did not feel isolated from each other.

As we continued through the semester I found that I would walk into the session and find some of the students there early, talking over the homework sets and helping each other with the difficulties they faced when they were solving the problems. The students did not know each other prior to the PLTL workshop, but came to know each other as reliable sources for help in the chemistry course work. I also found that they came to view me as a reliable source of advice in how General Chemistry is taught here at Washington University and how other related classes are taught as well. Often they would ask me question such as; "How should I study for this exam?", "What is your best advice for doing well in chemistry?", or even "What resources do you suggest to help in our second semester pre-medical classes?" I was a slightly surprised at first that they were asking me these question, but as I started to give them advice I simply was flattered that they had asked me. My groups became very comfortable asking other members for

help outside of what was asked of them in the PLTL workshop; the open environment allowed them to sort out some of their other confusion as well.

Finally, the greatest impact I felt that I had was in making the sessions more enjoyable to attend. As the members got to know and like each other, doing a chemistry problem set on the weekend didn't seem as bad. They also would comment on the fact that they enjoyed the time they spent in the session. The openness allowed my group to bond which was the driving force behind the positive group dynamic that was created in these groups.

Strengthening the Coulombic Forces within the Group

by Katherine Santosa

When I first stepped into Nemerov Seminar B for my first PLTL session as a leader, I was definitely nervous and anxious to meet all of my group members. I arrived a half hour early to prepare and was determined to start the group dynamics right from the start. I came in with candy, set the room up so that it was beneficial for group learning and had a great icebreaker prepared. Unfortunately however, I left the session with extra candy, mixed the names up of several group members and forgot to do the icebreaker altogether! It was pretty difficult to hear how well all of my friends' first sessions had gone.

After this session, I was really starting to doubt my abilities as a PLTL leader. Was I going to be able to unify the group? Moreover, were they even going to like me? Fortunately, the next session went smoothly and a few of the group members started asking questions and calling their peers by their names. I think being an efficient PLTL leader means that you have to initiate discussion in the group in order to build the group dynamics. Although each student is very unique and are strangers to each other, they all have one thing in common. All of them are in PLTL for General Chemistry because they want to perform the best they can in the course. As a leader, I recognized this and built on it.

I tried to relate my experiences in the course with them and explained that doing well in the course takes a lot of work but that it is very possible. Moreover, most of our sessions started off by talking about other professors and classes such as Calculus II. Since most of them were taking the same math class, they would usually talk about their last test and assignments for that week. Although this might seem like it would interfere with the session, discussions like these actually made them more comfortable with each other. As the group became more united, I began to notice that they started asking me questions as a group as opposed to asking me individually. For example, in the earlier sessions, most questions were directed at me. I tried to stop this habit by saying, "I don't know" and, "maybe you should ask your friends." After several instances of this, each group member would ask each other and they would only ask me if no one in the group

could answer their questions. However, this did not happen very often. They realized that most of their questions could be answered by their peers or by looking through their lecture notes.

In addition, I think the most important part of building a community is establishing everyone's role in the group. I made it clear to them that although I did well in the course, I was in no way in a position to answer all their questions. Also, relating my struggles with them made them perceive me as more of a peer than a lecturer or tutor. After this semester of PLTL, I feel confident saying that my leadership style is pretty laid back and think that it is most important to make everyone comfortable and welcome in the group. For example, when several of the students directed questions at me, I jokingly replied by saying, "I don't know. It has been a year since I have taken the class. Don't all of you go to lecture three times a week?" I would also try to have conversations outside of the session to see how everything was going and to get to know them better. This helped me initiate more conversations that applied to everyone in the group. Good topics usually include their last Chemistry exam and their tutorials for Chemistry Lab due the next day that they have not yet started. These conversations really start the session off enthusiastically and get all the group members talking.

After my group started to get to know each other, it was amazing to observe them work as a team. They would identify group members that were strong in one field and never left anyone behind. I have been privileged to work with all the students in my group this semester. And although things did not go as well as I anticipated in the beginning, we have been able to work efficiently and unite as a community. Building group dynamics is not easy and definitely takes patience but having the group unite is truly an incredible and rewarding experience.

Meeting the PLTL Challenge

by Vivek Sen

One of the things about PLTL that surprised me was how every session was such a drastically different experience. The problems were easy enough, but the group just didn't want to get work done on that day after WILD. Conversely, on some days extremely challenging problems were posed and yet we were finished with half an hour to spare, left debating why the Cardinals were getting beat by the Sox in the World Series. On another occasion, I had my students working on problem two out of seven with ten minutes to go in the session. Sometimes, students were half an hour late and at other times, bright and raring to go. I don't mean to portray such a dismal picture of PLTL, for it is as rewarding as it is testing, but I do want to focus my efforts in emphasizing the challenging nature of this position.

There is no one way or set of rules to follow in order to optimize your leadership through the weekly sessions. Much of this is a personal learning experience, but there are some generalities that every PLTL leader should pay attention to.

First, be prepared. Have all the problems laid out in front of you the day before and make sure you understand them. Think about the common mistakes you used to make for those are likely to be made by others as well. Consider some important questions to pose to enhance student understanding of concepts, without teaching it to them. Many a time came when I wondered how I could possibly have been picked to lead PLTL when I was looking at problems had no clue how to do them. It is infinitely harder to realize how to not do a problem than how to actually do the problem and in order to keep the students on the right track, this is what you will have to be doing for the majority of your facilitation. There came a time once when my students were having difficulty with a concept and I was unable to pose questions that would direct their understanding purely because of my lack of understanding that very same concept. Don't put yourself in awkward situations like those. Yes, you are not expected to master your material but you are expected to maintain a command of it. Therefore, be prepared. If you are having difficulty, there are plenty of people around to help you.

In order to encompass the less concrete, yet indispensable components of PLTL, I choose to focus on one of the keywords in this program: facilitation. Facilitation wasn't such an important word in my dictionary till a semester of PLTL sent it rocketing to the top. Creating a cohesive functional unit and positive group dynamic is one of the most challenging tasks to accomplish. Facilitation is a middle path. You are neither the mildly dictatorial teacher (that you will wish you could be after a few sessions), nor are you simply a proctor of group study. It is in achieving a balance of these that the greatest challenge lies. I have learnt, incompletely I might add, to mediate between these two. It is absolutely essential that a group be allowed to develop in their own specific way, and you are simply there to help them do just this. It is extremely important to make sure you establish and more importantly maintain a threshold level at which you intervene in group discussion. In my first few sessions, I answered way too many questions and explained way too much. I realized, later, that my students were getting dependant on me, and I had to distance myself from them, so that they could brainstorm together, instead of looking to me for assistance. There is no one particular threshold level for this. It depends entirely on the kind of personalities in your group. In your first meeting, assess the kind of personalities you are faced with and determine what kind of a balance you can achieve, given the kind of group you have. The kind of people you work with will integrally determine the tactics and parameters you set in your leadership. Remember that your students need to understand how you function just as well as they need to understand themselves and the peers with whom they tackle problems every week.

All of this will help you bring the group closer together, which you will realize is your indirect, but very real goal. We all know that people have different intellectual capacities and different learning styles. PLTL however asks of you to tie the knots, however thin the thread might be, between even the most disparate personalities. Make it a point to consistently analyze your performance during the sessions, but don't be too hard on yourself. Attend SAM, and feel free to voice issues. There are many ways to tackle problems, and that doesn't simply refer to the general chemistry problems. Rather, it extends in a very real fashion to PLTL sessions and the importance of different methods and ideas from a variety of sources cannot be overemphasized.

Lastly, realize that this is YOUR group. Do not be restricted in any way, except by the wide and flexible boundaries set forth by the PLTL philosophy. You will learn much, about yourself, about the subject you are facilitating, and about the students you work. For now, however, you are best served by turning over that page to learn of the next student's experiences, which will help you further understand what a unique experience PLTL is, and prepare you for the wide range of challenges you will face as a leader.

A Community Based on Social and Chemical Interaction

by Puneet Singh

Nine blank faces staring at me in silence. This was the situation I faced during that first PLTL session. A group of nine freshmen who not only didn't know what to expect of Chemistry, but they also didn't know what to expect of each other or me. It became very obvious from the start that I would have to work hard to bring together students of very different learning styles and abilities. The next question was one of how. To truly understand this, I had to examine my role as a facilitator and my relationship with the group.

The first several weeks involved building a small community of students who felt comfortable asking questions, were not afraid to admit they needed help, and enjoyed working with their peers. I realized that small actions on my part would help in creating this community. We worked more often in groups, and I made sure to switch around the groups, so everyone could work with each other. I would walk around to ensure that everyone was communicating; lack of communication would prevent the necessary interaction, and so, my goal was to ask questions until I could get the discussion going. When the students worked in pairs, I often had one put up the answer and the other explain the work. This was effective in getting everyone to understand everyone else's working and learning styles.

Despite my work to increase interaction at a small level, the group as a whole was not comfortable with each other. For example, the scribe would be up at the board, but no one was willing to suggest a method or ask questions about why a certain step was taken. The problem was not that they didn't understand the material; they were afraid to talk in front of the whole group. So, my first step was to go around the table and have everyone offer a suggestion, small or large, which forced them to talk. This really got them going, and then, I would ask leading questions to keep the discussion progressing. I always made a point to watch everyone to make sure they understood everything. In doing this, I could ask a confused student to ask the group his/her question, which created a comfortable environment for asking questions. Later in the semester, this helped extremely because the group members were used to asking each other for help.

The final piece to building a strong, interactive group was to increase their bonding on a level inside and outside Chemistry. I took time before and after exams to discuss my experiences as a student and for them, to discuss with each other how they felt about something. As they got to know each other, they would even socialize more between problems and before and after the session. I allowed this to a certain extent because in my opinion, it was necessary for them to realize that they had aspects in common besides Chemistry and that I was a student like them. Surprisingly, allowing socialization time really brought the group together and became an important factor in the building our community. Yes, it may have taken a few minutes of the two hours we had, but overall, it helped our group move through the stages of group development much faster. Before I knew it, we had made it to the performing stage, where the philosophy of PLTL is really achieved.

The Wizard of PLTL

by Jordan Swensson

“Pay no attention to the man behind the curtain!” For those of you who haven’t seen *The Wizard of Oz* that’s a line uttered by a funny little magician trying valiantly to keep his identity a secret even though it’s far too late. Beyond it being a classic line, it reminds me of being a PLTL group leader. We are there to create a community, to gather together students new to college academia and help them coalesce and get along. And yet, our main academic role is one of a facilitator, not a mentor, tutor, or answer key. Which raises an interesting question: how do we balance the need to be part of the group community with our role as a somewhat detached helper? They seem to be countervailing desires. But I definitely think it’s possible. All it takes is a little clever curtain work.

In the film, the magician is using the curtain to hide himself while he manipulates an image for others to see. This image is his strong side; it gets things done, it gives out directives, and it inspires the people who see it to action. Of course, it also involves spitting fire and intimidation, but this is a loose analogy. Even if I could spit fire I don’t think that would be a good way to help my PLTL group. But once the curtain is down, the magician is a different person. He offers friendly advice, is energetic, and immediately becomes close to those he meets. As I see it, as a PLTL group leader you are the magician, the wizard of your group. But, unlike him, you have complete control over the curtain. You can lower and raise it at a moment’s notice depending on the situation. When the curtain is up you are the face of PLTL, running the show and making sure that your group members are on task and helping one and other grasp the material. Here you ask your probing questions and help direct the group down the path that will lead them, not necessarily to the “right” answer, but to the skills they’ll need to tackle any problem that may stand in their way in that session, on the next test, or sometime next year. And then, when the time is right you lower the curtain and stand before them as part of the community. Maybe you’ll take it down between questions, definitely at the beginning and end of the sessions, or maybe just for ten seconds to give your opinion of the food at Mallinckrodt (it’s bad). The students in your group will get used to that

curtain soon enough, and as the semesters and years go on you'll get better and better about knowing when to raise and lower it.

Believe it or not your group will develop into a community faster than you probably think it will. And I'm sure that by now you've read about a number of really brilliant ways to help that happen. Some of it will just happen when you're not looking. Sometimes you'll have to give the group a nudge in the right direction. But your personal role in the community is entirely up to you and your curtain work. So do your best and have a little fun with it. You'll see that the important thing is that you'll be a part of the community in a way that will help you to be a more effective PLTL facilitator and a familiar and comforting face to your students. Because who really wants to spit fire anyway?

Creating a Covalent Community

by Anjan Tibrewala

At the onset of PLTL this semester, it's inevitable that the focus of the sessions were on the problem sets. It was because of the problem sets that the group met every Sunday and the purpose of PLTL was to obtain the answers to a handful of chemistry questions. Although the students had obviously worked in groups before, there wasn't an overwhelming cohesiveness to the group.

Over time, change did become evident. The group did in fact become one unit rather than the sum of multiple parts. But there are many factors that go into such a transition. First and foremost, there were changes, although somewhat subtle, in the role of the leader over time. In the first few sessions, the group dynamic is very much dictated by the leader. I had to keep everyone involved by changing the methods or calling on the more reserved people to contribute to the group. I needed to ensure that the group members felt comfortable with all the other group members. I had to allow the group to buy into the methods by letting them see for themselves that they work and believing in them myself. Gradually, I found myself needing to be less involved. As the students became more comfortable with each other, all I needed to do was maintain a good learning environment, not create one. As the students bought into the process, all I needed to do was become part of it, asking questions and keeping the group focused.

Many of the changes that did occur in the group dynamic happened as a result of the PLTL process and methods. The change was a bit more subtle, but still present nonetheless. From the beginning, many of the students resisted the PLTL methods, as they would much rather work through the problems at their own pace and simply use the leader and other students as aids or to check a solution. However, as the problems got more difficult, the students needed to rely on the group more and more. They began to realize the efficacy of the methods and became accustomed to using them to solve the problems. For our group, it seemed like different methods developed various aspects of the group dynamic. Small group and pairs, particularly effective for our group, allowed the members to form better relationships with one another, but also allowed everyone to contribute. Scribe kept everyone on the same page and really emphasized the processes

and concepts behind solving the problems. Round-robin made people more confident and willing to contribute when working as a group. It also eased qualms that many of them had about asking each other for help. So, the methods really were an integral part of the process of our group.

Ultimately, the manner in which our group interacted inevitably became a function of the personalities and learning styles of the individuals. It may seem counterintuitive to the whole notion of becoming a cohesive PLTL machine, but in the end, that's what makes PLTL meaningful to each individual. Everyone seemed to find a comfort level in the group in terms of being able to ask questions, work together, and understand concepts. Not only that, but people became attuned to how the other students preferred to work, and all these ever so slight variations all meshed together. For example, our group seemed to work best when everyone was involved, lending itself toward methods such as small groups, pairs, and scribe. Members of the group also responded better to conceptual questions about the problems rather than simply explaining work that was already on the board and such. The leader and the methods can bring a group together, and help along the group dynamic, but it was really these individual intricacies and personalities that made the group come alive for us.

Bonding and Integration: Creating a Covalent Community

by Shreepada Tripathy

When I walked into my first day of PLTL, my main concern was how I going to get the group to act as a cohesive unit. As I was setting up for my session, several questions were going through my mind, such as would the students like each other, or even would they like me. The students came in, and we talked for a little bit just to get to know each other. I had the students say something about themselves. When we got to the problems, I made the students work in small groups the most in order to get the students to work together, and it seemed to work. The first week was not a disaster like I thought it was going to be, but something had to be done in order to get the students to work better together.

One thing that I did to make the students know each other better was to switch people around in groups in order to get everyone to know everyone. It is a good strategy that worked effectively. There were also some things that I did not do that made the cohesion in the group better. For example, some of the students started studying together outside of PLTL, which was nice to see. One of the more interesting things that I heard about was that some of the students were going to parties together and hanging out together.

Another thing that helped me a lot was the SAM course led by Dr. Frey. It was really helpful for me to hear about the other problems that other leaders were having and also hearing solutions. When a problem like one the leaders talked about in class came up, I took the advice of my fellow leaders and applied it. For example, one student was remarkably quiet during PLTL. The student was not being part of the group and that worried me. I suspected that maybe she did not know the material, but was being quiet so that no one would call on her. I was not sure on how to be certain on whether she actually knew the material, but then I remembered in SAM class, we had discussed what leaders should do when this situation arose. It was suggested that the leader should call on the quiet student more, and make her be a part of the group. I applied what had been said, and it worked. I started out with an easy question, to boost the student's confidence if confidence was an issue. I called on the student again, this time with a harder question,

and the student knew the answer. Then next week, she became part of the group more. It felt very good to see the student be more outgoing and ask more questions.

The biggest suggestion I can offer to future leaders on how to make the group work together is not to force anything. It is ok to gently push your students, but it is not ok to make them do something that they do not want to do. A leader is just a facilitator. Only the students will decide if or even when they become a cohesive unit. It probably will not happen within the first couple of weeks. It was only in my last week that the students reached the final level of performing of group dynamics. It takes time for the students to know each other, so do not feel bad if it takes a while to go through all the problems just because the dynamics of the group are not developed. In time, the group will come together, and when it happens, it will be worth the wait to see the students at their full potential.

Bonding and Integration: Creating a Covalent Community

by Lucy Vine

My first impression of PLTL was, of course, my Chemistry PLTL sessions from last year. I had an idea of how PLTL should run, and what should and should not be done, but what I did not realize at first was how much variability and flexibility comes with the position of a PLTL leader. No one group of students is exactly similar to another. Learning to adapt to any group and finding ways to ensure the success of a given group are all challenges that face a PLTL leader. Essentially, each PLTL group is a unique group of elements bonded in a specific way with a specific bonding order. Your group is a compound like no other and only under certain conditions will it be allowed to thrive. Those conditions are both general and specific with regards to other PLTL groups, and are the core foundation upon which your PLTL group will build a community.

Community?? Yes, PLTL is not only about getting problem sets done, but is also about providing the students with both a social and academic community. As the group develops, the group is ideally self-sufficient and each student begins to depend on each other with confidence. Each student brings a different strength, weakness, or learning style to the group and your job as the PLTL leader is to bring out the best in each of them so that the overall group may be able to reach its potential. As the PLTL leader, you must develop the best suitable bonding scheme given the talents and interests of each individual in the group. By boosting their self-confidence and fostering an open and encouraging small academic community, the PLTL leader will help students attain success not only as a group but as independent learners in the overall Washington University community.

For example, figuring out the bonding scheme of your compound may include discovering which element bonds best to which element according to structure or valence. You may find that some students work better together than others. It is always best to switch pairs and groups around so that everyone can get a chance to work with each other, and eventually you will notice that some combinations are more productive

than others. Usually the best combinations are those that compliment each other in strengths and abilities as well as learning styles.

Also, each compound differs with respect to physical and chemical properties. In other words, what works for one group may not necessarily always work for another group. Some groups prefer scribe while others are more successful with round robin. Tailoring your approaches and methods to the group's needs is an important aspect, but a caveat would be not to lose the rich diversity or learning experience that comes with a selection of different methods. For instance, my group this semester struggled with participation in scribe. The scribe (usually hand-picked because no one would volunteer) would stand at the board dumb-founded as no one volunteered any ideas. Instead of doing scribe the old-fashioned way, I added round robin to it so that as the scribe (or myself if no one wished to be scribe) stood at the board, each student would have to say something about the problem: either an idea, approach, or concept they thought might be useful. This modification was extremely successful as are many other modifications that other leaders find and discuss in SAM.

The most important thing to remember would be to expect anything and prepare for everything. Being flexible, patient, and capable of customizing your own PLTL session in order to create the best covalent community possible for the group are what make PLTL leadership a unique and rewarding experience.

Will It Always Be Like This?

by Charles Walcutt

After my first session as a group leader, I remember having some very pessimistic thoughts. I had just seen nine General Chemistry students come together for two hours to do problems, but it would have made no difference if they had been working by themselves in the library instead. The students had been working as individuals, not as a group, which led me to ask myself, “Will it always be like this?” As it turned out my group was just in the beginning stages of a healthy group dynamic, and their interactions would improve with time. There is an important note to make though—while the group dynamic lied in the hands of its members, the group did not reach the performing stage all by itself. As the group leader I had to step in when I saw that the group needed a little coaching. But that was just it; group leaders should not try to force their group into working more cohesively. The group members themselves will ultimately be in control of how the group dynamic progresses.

Like I was just describing, my group’s first meeting was not exactly a smooth one. The students had never met and kept mostly to themselves. The students’ major concern as we worked through the problems was whether or not the answer on their paper was correct. They gave little attention to one another, and most of their interactions were arguments over which answer was correct because they did not work together. I could see right then that my group had a long way to go in order to achieve a good group dynamic.

After every session I took note of the problems that my group was having and wrote about them in my weekly reflections. I also paid close attention during SAM course to hear what problems other group leaders were experiencing and their ideas on how to integrate our groups. Through my own reflection and help from other leaders, I learned great ideas on how to move these nine chemistry students from individuals to a group. Reminding the students to be more talkative in their small group work and asking the group for feedback after each part of round robin problems proved to be the extra push the students needed to begin the shift to a functioning group. It was not long until

my group members saw the positive effects of working together rather than by themselves.

Just as soon as the group dynamic appeared to be on its way to success, new problems in my group appeared. Issues like attendance, tardiness, and students completing their homework before the session seemed to come out of no where. As soon as I recognized that these issues were having a negative impact on the group's dynamic, I had to do something about them. I ended up having to explain the importance of coming to every session on time and being sure to work through all of the homework problems before meetings at the end of one of my sessions. I simply brought the issues to the attention of the group members and asked them to consider changing their current habits. I did what I could to see that the problems were resolved.

As with all of the group problems I have described, whether I would see any improvement in the group was entirely up to the students. I could not make them work well together, and I could not force them to do their homework or show up on time. I just had to put in my guidance and have patience with my group in the hope that they would consider it. Sure enough, I did see my group improve on these issues. In the end, each member wanted to take the most from the group and that could only be achieved through a good group dynamic. Students discover that working together and taking the extra steps to make the group run more smoothly were worth being able to learn the most during our two hour meetings. As a leader the task becomes simple—facilitate your group as best you can and have faith in your members.

Creating a Covalent Community

by Christina Wang

Before the first PLTL session even begins, I knew I had a diverse group, just from reading their responses (or lack thereof) to my email. Some were witty, some were curt, some were excuse-finders, some were polite, and a tiny few were excited. Making that first impression and getting my group members to work with each other was quite a challenge.

To my surprise, the first session went extremely peacefully and I thought, “Well this is going to be easy on me. I don’t have to work to get them to cooperate.” I was really wrong, because as soon as they got acquainted with the atmosphere, their true personalities shone through their first-time politeness. The excited ones hogged the show, the curt ones shrunk into their own world and worked alone, the excuse-finders tried to miss sessions whenever possible, and witty ones remained witty, which was nice, but they failed to stay on task. It became a nightmare come true. Progress started to slow, and people were at each other’s necks. A lot of disrespect was shown to fellow peers, either by not paying attention or interrupting. I needed to build a functional community so they could all help each other understand better, because that’s what PLTL tries to accomplish.

At almost every PLTL session, I would have to emphasize the importance of not working ahead. Working ahead stunk because they couldn’t work cohesively on one problem at a time, which caused the slow learners to remain slow and confused and the fast learners to merely do more problems in addition to their problem sets. That was pointless, and I had to change those few that detracted from the group effort. This took time, but eventually, they quit working ahead and became more vocal and more of an asset to the group.

During pair or group work, I found it necessary to group different people together, usually a quick and slow learner, or a loud and quiet learner. Because they had to both arrive at an understanding, they would help each other get through the problem, and in this process, they learned to communicate.

What also worked for me in establishing a community was talking to them, and establishing a good peer-to-peer-leader relationship. I would ask them about their week, if they had any exams, what they thought of lectures, and so on. This helped them get more comfortable with me, and what was really great about it was that someone would usually feel the same way about something and they would start a conversation of their own.

All this took an immense amount of time, and it didn't start feeling like a community until near the end, but the truth is that it doesn't happen over night, but through patience and the will to make it work and putting that will into action builds a lasting group that have learned not only chemistry but to work with people they never imagined working with and having that process be successful.