Undergraduate Research Seminar - Peer Lab Instructor Manual

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"Students will always learn best that which they have figured out for themselves, but they will learn nothing if they never get it at all. We do the students a disservice either by furnishing too much information or by not providing enough help. Our goal, then, must be to give them guidance while encouraging their development into independent workers who can think on their own".

-Anonymous TA philosopher

Bundling Science: Enhancing Lower Division Science Education Through Interdisciplinary, Collaborative Research Experiences

Bundling Science develops the core skills needed to succeed in science while inspiring students to explore the questions that matter most to them in baccalaureate, and ultimately graduate, study. We hypothesize that this approach will increase STEM retention and graduation of diverse undergraduate STEM majors (the key NSF STEP goal) while developing increased scientific literacy in participants. Our extracurricular approach complements textbook-based first-year curricula by providing students opportunities to think independently as they evaluate methods and data and to collaborate with peers and others as they participate in research.

A unique element of our model is the combining of learning activities into a choice of interdisciplinary undergraduate research seminars that enable students a deep, multi-faceted understanding of each scientific question they explore. These bundles distill and integrate the best of the hands-on projects now being done with advanced high school and lower division college students.

The key venue for these goals will be a 3-hour weekly, voluntary non-credit (at present) STEP seminar. Both freshman and sophomores will work in teams of 6-10 students; freshman will participate in a 6-week pre-planned seminar and sophomores, as they begin to be more independent in planning extended research studies, will participate in seminars that are more loosely designed. For freshman STEP students, a URS will consist of:

- A real-world, cutting-edge and socially-relevant issue or topic described in an accessible article in the popular media *(Scientific American*, *Discovery*, TED talk, *APA Monitor*, etc).
- A follow-up carefully-chosen professional article on the same topic that students will learn to read by means of the C.R.E.A.T.E. method (*consider*, *read*, *elucidate* hypothesis, analyze data and *think* of the next *experiment*).
- A relatively-open ended set of experiments (Table 2), with clearly-defined research skills relevant to the issue or topic.
- A discussion component based on “3 steps forward”, encouraging students to think about broader applications or implications, with ethics, feasibility, applicability and policy issues to contextualize the research in the real world.

Freshman will carry out a rotation of several of these bundles throughout the year in an **Undergraduate Research Seminar Series (URSS)**. The rotation through the projects for freshman emulates the lab rotations in the first year of graduate school, so that students will be exposed to projects in different areas of science before they make more enduring choices.

Definitions and Terms

Undergraduate Research Seminar (URS) – A 3- to 6- week session within the Undergraduate Research Seminar Series with a specific real-world and cutting-edge focus (e.g. Forensics or Cortisol and Stress) and the following components:

- An accessible article in the popular media
- A follow-up carefully-chosen professional article on the same topic
- A relatively-open ended set of experiments with clearly-defined research skills relevant to the issue or topic.
- A discussion component based on "3 steps forward"

C.R.E.A.T.E. (Consider, Read, Elucidate hypotheses, Analyze data, and Think of the next Experiment) – a method of approaching academic literature where students are encouraged to think about how they would design their own research projects.

Peer Lab Instructor (PLI) – The PLI will guide an Undergraduate Research Seminar Group (URS Group) through each Module of a Bundle, utilizing aspects of Peer Led Team Learning (PLTL), Supplemental Instruction (SI), and active teaching to facilitate learning of each Bundle topic.

Peer-Lead Team Learning (PLTL) – An approach to learning that utilizes well-performing STEM students to act as peer leaders of groups. Peer Leaders meet with groups and engage in problem-solving and discussion techniques to facilitate a deeper understanding of a particular concept.

Supplemental Instruction (SI) – An approach to learning in which students work collaboratively by discussing readings, comparing notes, working together to predict test items, and sharing ideas. Students are moderated by a Supplemental Instruction Leader, or SI Leader.

Undergraduate Research Seminar Series (URSS) – A year-long rotation of 4-6 interdisciplinary URS, along with seminars on specific research skills (e.g. research process, data, ethics), designed to introduce freshmen and sophomore students to research science fields and lab skills.

Undergraduate Research Seminar Group (URS Group) – A group of 6-10 freshmen and sophomores, led by a Peer Lab Instructor, participating in the Undergraduate Research Seminar (URS).

The effects of stress on salivary cortisol levels:

This seminar will explore the effects of stress on cortisol levels. Cortisol is a stress hormone that is released into the bloodstream for a quick burst of energy to escape a dangerous situation. As we often don't need this response to escape panthers, our body responds to emergencies like public speaking, calculus midterms and an accidental text to the wrong person in much the same way. This has consequences on individual health, and in the overall health of the public.

In this seminar, you will guide students as they design a psychological experiment to examine stress and stressors, administer it to another group, collect salivary samples to quantify cortisol levels and analyze the results. Students will gain experience in designing psychometric experiments and in quantification methods using an enzyme-linked immunosorbant assay (ELISA).

Peer-Led Team Learning

Peer-Led Team Learning (PLTL) is a nationally recognized model of teaching and learning that originated in a chemistry course at the City College of New York in 1991. In PLTL, students who have done well in a STEM course are recruited to be peer-leaders: students who facilitate learning groups as an integral part of the course. Each week, the peer-leaders meet with their group to engage in problem solving and discussion of course material. The PLTL model has been adapted to many institutions nationwide across all STEM disciplines, and an extensive body of research has demonstrated that PLTL improves student learning.

Supplemental Instruction

Supplemental Instruction (SI) is an academic assistance program that utilizes peer-assisted study sessions. SI sessions are regularly-scheduled, informal review sessions in which students compare notes, discuss readings, develop organizational tools, and predict test items. Students learn how to integrate course content and study skills while working together. The sessions are facilitated by “SI leaders”, students who have previously done well in the course and who attend all class lectures, take notes, and act as model students.

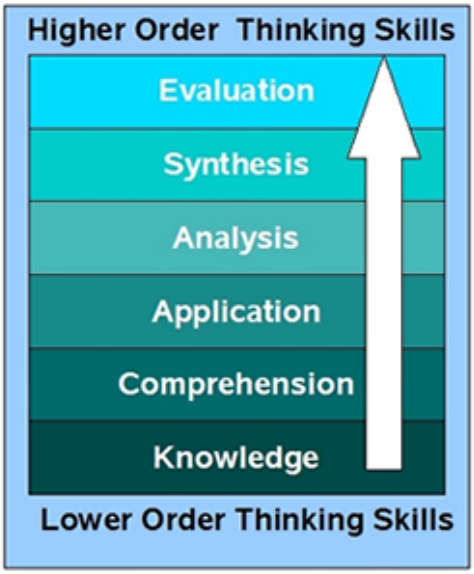
Purpose:

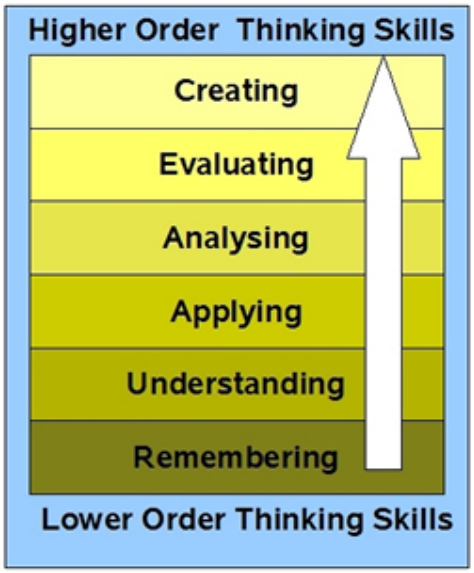
1. To increase retention within targeted historically difficult courses
2. To improve student grades in targeted historically difficult courses
3. To increase the graduation rates of students

How Students Learn

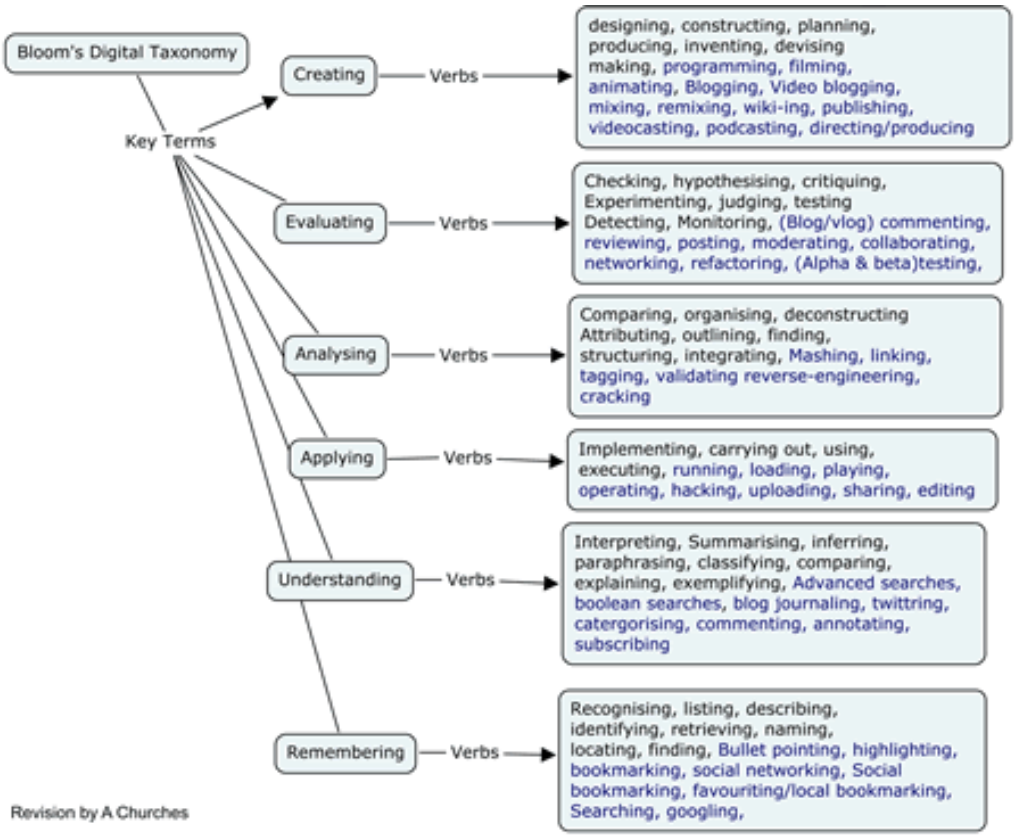
Theory	Theorists	Theoretical Principles	Application
Behavioral Learning Theory	**Watson Skinner Bandura Ausubel Herbart**	• Principles of learning apply equally to different behaviors and to different species of animals. • Learning processes can be studied most objectively when the focus of study is on stimuli and responses. • Internal cognitive processes are largely excluded from scientific study. • Learning involves a behavior change. • Organisms are born as blank slates. • Learning is largely the result of environmental events.	
Cognitive Developmental Theory	**Brunner Piaget Flower Hayes**	• Objective, systematic observations of people's behavior should be the focus of scientific inquiry. • Individuals are actively involved in the learning process. • Learning involves the formation of mental associations that are not necessarily reflected in overt behavior changes. • Learning is a process of relating new information to previously learned information.	
Social Inter-dependence Theory	**Geerts Vygotsky Bakhtin Doyle Erickson**	• People can learn by observing the behaviors of others and the outcomes of those behaviors. • Learning can occur without a change in behavior. • The consequences of behavior play a role in learning. • Cognitionn plays a role in learning.	
Interpretive/ Critical Theory	**Freire Apple Kozol Marx**	• Good pedagogy empowers learners to take control of their own learning processes • Education is a political process in that it involves issues related to power and control • Learning should have as its goal liberation rather than domination. • Educational practices should seek to overcome the learner's "culture of silence"	

Bloom's Taxonomy





In the 1950's Benjamin Bloom developed his taxonomy of cognitive objectives, Bloom's Taxonomy. This categorized and ordered thinking skills and objectives. His taxonomy follows the thinking process. You cannot understand a concept if you do not first remember it, similarly you cannot apply knowledge and concepts if you do not understand them**.**



C.R.E.A.T.E. Method

The C.R.E.A.T.E. (**C**onsider, **R**ead, **E**lucidate the hypotheses, **A**nalyze and interpret the data, and **T**hink of the next **E**xperiment) method is a new teaching approach that uses intensive analysis of primary literature to demystify and humanize research science for undergraduates.

C.R.E.A.T.E. Steps (based on Bloom's Taxonomy):

CONSIDER

- Concept map of introduction
- Review main concepts
- Relate old and new knowledge
- *Bloom level 1, 2, 4*

READ

- Cartoon each experiment
- Look up vocabulary
- Annotate the figures
- *Bloom level 1, 2, 3*

ELUCIDATE hypotheses

- Use cartoon to derive question being asked/hypothesis being tested
- Write a title for each cartoon
- *Bloom level 3,5*

ANALYZE

- Write a title for each figure
- Create templates for each experiment
- Transform data (tables to figures; re-cast figures as appropriate)
- Discuss data
- Write your own discussion
- Write a title for the paper
- *Bloom level 3, 4, 5*

THINK of the next EXPERIMENT

- Design and cartoon a new experiment
- Model overall experimental system
- Pitch your experiment to a "grant panel"
- Compare/defend/debate various experiments
- *Bloom level 1, 2, 4*

Stages of Group Development

Stage 1: Forming

In the Forming stage, personal relations are characterized by dependence. Group members rely on safe, patterned behavior and look to the group leader for guidance and direction. Group members have a desire for acceptance by the group and a need to know that the group is safe. They set about gathering impressions and data about the similarities and differences among them and forming preferences for future subgrouping. The major task functions also concern orientation. Members attempt to become oriented to the tasks as well as to one another. Discussion centers around hot to define the scope of the task, how to approach the task, and other similar concerns.

Stage 2: Storming

The next stage, called Storming, is characterized by competition and conflict in the personal relations dimension an organization in the task-functions dimension. As the group members attempt to organize for the task, conflict inevitably results in their personal relations. Individuals have to bend and mold their feelings, ideas, attitudes, and beliefs to suit the group organization. Because of "fear of exposure" or "fear of failure," there will be an increased desire for structural clarification and commitment. Although conflicts may or may not surface as group issues, they do exist. Questions will arise about who is going to be responsible for what, what the rules are, what the reward system is, and what criteria for evaluation are. These reflect conflicts over leadership, structure, power, and authority. There may be wide swings in members' behavior based on emerging issues of competition and hostilities. Because of the discomfort generated during this stage, some members may remain completely silent while others attempt to dominate.

In order to progress to the next stage, group members must move from a "testing and proving" mentality to a problem-solving mentality. The most important trait in helping groups to move on to the next stage seems to be the ability to listen.

Stage 3: Norming

In the Norming stage, interpersonal relations are characterized by cohesion. Group members are engaged in active acknowledgment of all members' contributions, community building and maintenance, and solving of group issues. Members are willing to change their preconceived ideas or opinions on the basis of facts presented by other members, and they actively ask questions of one another. Leadership is shared, and cliques dissolve. When members begin to know and identify with one another, the level of trust in their personal relations contributes to the development of group cohesion. It is during this stage of development (assuming the group gets this far) that people begin to experience a sense of group belonging and a feeling of relief as a result of resolving interpersonal conflicts.

The major task function of stage three is the data flow between group members: They share feelings and ideas, solicit and give feedback to one another, and explore actions related to the task. Creativity is high. If this stage of data flow and cohesion is attained by the group members,

their interactions are characterized by openness and sharing of information on both a personal and task level. They feel good about being part of an effective group.
The major drawback of the norming stage is that members may begin to fear the inevitable future breakup of the group; they may resist change of any sort.

Stage 4: Performing
The Performing stage is not reached by all groups. If group members are able to evolve to stage four, their capacity, range, and depth of personal relations expand to true interdependence. In this stage, people can work independently, in subgroups, or as a total unit with equal facility. Their roles and authorities dynamically adjust to the changing needs of the group and individuals. Stage four is marked by interdependence in personal relations and problem solving in the realm of task functions. By now, the group should be most productive. Individual members have become self-assuring, and the need for group approval is past. Members are both highly task oriented and highly people oriented. There is unity: group identity is complete, group morale is high, and group loyalty is intense. The task function becomes genuine problem solving, leading toward optimal solutions and optimum group development. There is support for experimentation in solving problems and an emphasis on achievement. The overall goal is productivity through problem solving and work.

Adapted from:

Tuckman, B. (1965) Developmental Sequence in Small Groups. Psychological Bulletin, 63, 384-399.
Tuckman, B. & Jensen, M. (1977) Stages of Small Group Development. Group and Organizational Studies, 2, 419-427.

Group Behaviors

Group behavior is defined by its purpose or function. When group members speak, they might be 1) working toward accomplishing the group's tasks, 2) "fixing" relationships among group members, or 3) tending to their own desires without regard for the need of other group members or the group task. The LeaderShape Institute, a college program for student leader development, identifies these three behaviors as Task-Oriented Behaviors (TOB's), Maintenance-Oriented Behaviors (MOB's), and Self-Oriented Behaviors (SOB's).

The first two behaviors are necessary to ensure that the group stays on task and functions effectively. The third type should be avoided and discouraged. Reinforce and model the first two behaviors when you recognize them, and encourage students to adopt them as much as possible. As a tutor, you need to recognize and demonstrate these behaviors so that you can reinforce and model the first two and squelch the third one.

Task-Oriented Behaviors (TOB's)
TOB's are those that keep participants on task so that they can accomplish their goals. Behaviors that demonstrate the wish to accomplish include:

- **Initiating task-related activities:** proposing ideas or procedures; otherwise, no one would speak at all or side conversations would begin. "Let's move on to the next step."
- **Seeking or giving opinions or information:** promoting the clear and efficient flow of information; assures that decisions are made based on complete information and benefits everyone, not just the one who wants the information. "We could take a look at this report."
- **Clarifying or elaborating:** listening and collaborating so that important information is not lost; helps illuminate or build upon others' ideas or suggestions. "What if we added this step to the process?"
- **Summarizing:** pulling the discussion together so that everyone can assess progress. "So first we'll do this part and then we'll do that, right?"
- **Consensus testing:** testing the consensus of the group; urges participants toward a decision and adds positive tension. "Can we vote on this now?"

Maintenance-Oriented Behaviors (MOB's)
MOB's are those which assure that the group maintains a good working relationship and continues to work toward its goals. They include:

- **Gatekeeping:** keeping communication open by bringing quiet members into the discussion and asking verbal ones to give others a chance. "Let's give Marie a chance to finish her thought."

- **Encouraging:** making sure that relevant and necessary information is shared; this behavior is warm and responsive. "Before we make any decisions, Pete, could you tell us what you think about that?"

- **Harmonizing/Compromising:** Smoothing over issues (harmonizing) or having everyone give in a little bit (compromising); these can be negative behaviors because their overuse can mask important issues and reduce group effectiveness; however, harmonizing relieves tensions and recognizes differences while compromising admits errors and modifies a position. "Let's reconsider Michelle's suggestion."

Self-Oriented Behaviors (SOB's)

SOB's most often occur when the group is first forming, when participants are on a tight schedule, or when the task at hand is especially difficult and creates stress within the group. Many behaviors represent these negative responses:

- **Aggression:** trying to raise status by criticizing or blaming, by showing hostility, or by deflating the ego or status of others in the group. "Aww, come on! You can do better than that!"

- **Blocking:** interfering with the group's progress by going off on a tangent, bringing up topics unrelated to the problem, arguing too much on one point, or rejecting ideas without consideration. "Did anyone see the game last night?"

- **Seeking Sympathy:** playing the martyr, trying to get sympathy and support. "I just can't seem to do anything right for you guys."

- **Manipulating:** introducing or supporting ideas that promote one's own interests rather than the interests of the group. "Let's let Richard to it. I'll bet he's good at it."

- **Seeking attention:** calling attention to oneself through loud or extreme behaviors; disrupting the group's progress. "Hey, Terry! Come on over and say hi!"

- **Withdrawing:** Remaining passive, daydreaming, attending to anything but the work in progress.

- **Competing:** Trying consciously or unconsciously to rival others in an effort to look more helpful in order to gain favor from group leaders. "But **I** can take care of that one!"

TOB's and MOB's can be productive and necessary for creating a cohesive group, but SOB's are disruptive and impede group progress. If individuals are exhibiting self-serving behaviors, the group members should utilize TOB's and MOB's to thwart the behavior.

Adapted from the Rinella Learning Center's "Peer Tutoring: A Guidebook" at Miami University

Utilizing PLTL, SI, and Effective Teaching Strategies into each URS

- Running a URS requires careful preparation. Never go into a session intending to "play it by ear."

- Build flexibility into the module.

- It is more effective to "model" how successful students learn about research, than to "tell" students how to do research.

- Give adequate time for students to formulate thoughtful answers. If you are uncomfortable, join with students in looking at notes or through articles.

- Avoid taking on the responsibility of providing answers or ideas. Suggested phrases to redirect:
    - Does anyone know the answer to that question?
    - What do you think about that?
    - What are we trying to find out?
    - What else did they do?
    - What are you assuming?
    - Why would that be so?
    - Give an example of that.
    - How does your response tie into…?
    - Can you summarize the discussion up to this point?
    - Let's see if we can figure it out together.
    - Can you think of another way to think about this?
    - What do we need to know to answer the question?
    - Let's rephrase it on the board and figure out what information we will need to figure it out.

- When redirecting, be conscious of verb choice:
    - Looking for Knowledge: define, record, list, recall, name, relate
    - Looking for Comprehension: translate, discuss, explain, recognize, review
    - Looking for Application: apply, employ, demonstrate, practice, illustrate
    - Looking for Analysis: analyze, differentiate, criticize, debate, relate, examine
    - Looking for Synthesis: compose, plan, design, formulate, construct, create
    - Looking for Evaluation: evaluate, compare, value, assess, measure

- Encourage students to summarize what's been discovered already, and to apply that to future discussions.

- Avoid interrupting students, and protect students from being interrupted by others.

- If an answer or idea is incorrect, encourage the student to look this up in his/her notes or in the article.

- Provide closure to a module by summarizing and synthesizing what has been discussed so far, and relating it to a news article, real-world experience, or other scientific field. This helps each student find the topic relevant, interesting and will aid in recognizing science in his/her daily lives.

- Employ Collaborative Group Learning Techniques
    - Group discussion
        - A general discussion of an issue or topic by the group
        - Individual members are free to contribute
        - Requires skill to use successfully
        - Ideally, everyone is involved
    - Clusters
        - Group is divided into smaller groups
        - After discussing, each sub-group then reports back to main group
        - Ideal to take two sides of an issue or tackle a topic from different perspectives
    - Turn to a partner
        - Similar to clusters, but helpful for quick answers
        - No need to preview or review concepts
    - Think/Pair/Share
        - Students get a specific amount of time (e.g. 1 minute, 5 minutes) to think about a topic
        - Then discuss in pairs, then share with the group
        - The extra time allows students to design more thoughtful and creative discussion points
    - Presentations
        - Formal uninterrupted presentation delivered by a student to the group
        - Should be employed sparingly and only with independent research

Duties and Responsibilities for PLI's

- Attend Lab Instructor orientation sessions as scheduled.
- Conduct the laboratory classes assigned to you with the highest level of professional ethics.
- Attend scheduled meetings with the coordinator as scheduled. These are mandatory and any absences must be pre-arranged and a separate appointment scheduled.
- Submit weekly updates by email. These are due each Sunday evening by 5pm during the seminar.
- Make yourself available by email to your peers.
- Be responsible for the cleanliness and orderliness of the lab at all times and leave it ready for the next group.
- Tag any broken equipment and bring it to the attention of Lori Sims, and if possible place in the designated repair area.

Conduct and Discipline in a Lab

- The laboratory should always be conducted in an orderly and safe fashion. Be firm and fair with the students.
- Rights of students
- The students should be encouraged to bring any questions, problems regarding the conduct of the lab to the PLI first. Treat students with respect and earn their trust. They should never feel threatened by you.
- Rights of PLIs
- The PLI should bring questions about the lab directly to the coordinator first. This includes problems with students, scheduling conflicts or lab procedure.

Duties that Apply to Teaching a URS

In preparation for each session:

1. Arrive to the session early, and know the topic in great detail so that when students ask questions during you do not need to take time to page through the materials to find an answer. PLIs are encouraged to perform each experiment before the students do them. This can be arranged by setting an appointment with Lori Sims (lsims@brooklyn.cuny.edu). Supplies for the experiment will be available the Monday afternoon before the seminars begin. Study the experiment and then review it before the session.
2. Be familiar with all the material, and spend a little time researching different aspects of the topic. The different directions you can guide the students are helpful to better and fully understand the topic. Feel free to relate it to any research you've done previously.
3. Prepare ahead of time any announcements and instructions that you need to give the students at the beginning of the laboratory period.
4. In case of an unforeseen, last-minute emergency (emergencies only!), PLIs should contact Lori Sims (718-951-5000 x 1707) as soon as possible so a substitute can be arranged.
5. Learn the students' names.

At the beginning of each session:

1. Be at least 15 minutes early.
2. Write announcements, safety warnings, and any other information for the students on the board.
3. Be sure that chemicals and all items of equipment have been brought into the laboratory.
4. Be sure that the airflow in ventilation hoods is turned on when necessary.
5. No students are allowed in the laboratory without a PLI.
6. Greet students by name as they enter the laboratory.
7. Explain why you are excited by the course material. Enthusiasm can be contagious.

During the session:

1. In the event that an experiment is not giving the anticipated results or if there are equipment issues, contact Lori Sims (718-951-5000 x 1707) IMMEDIATELY.
2. Maintain strict cleanliness of the lab.
3. Be sure students take only the amount needed for an experiment and that all bottles or containers are properly closed.
4. Be sure that students properly dispose of chemical waste. Funnels must be used with waste bottles. Caps on waste bottles must be replaced whenever the waste bottle is not in use (typically at the end of the laboratory period). The cap does not have to be tightly screwed on, especially if gases are being generated in the waste bottle.
5. Be sure that students properly dispose of broken or used disposable glassware in the designated receptacles. Most paper waste can be put in the regular trash.
6. Be sure students maintain clean and neat laboratory working areas.
7. Never leave the laboratory unsupervised.
8. Be sure that students do not record data on scraps of paper. All data must be recorded in permanent ink directly in laboratory manuals or notebooks.
9. Be sure to circulate continually around the laboratory to observe what your students are doing and to provide advice or ask questions. Never bring into the laboratory with you some assignment from your own research or classes. Do not sit in one place in the laboratory to do your own work. During the laboratory period, you are obligated and are being paid to devote all your energies to your students' safety and learning.
10. Ask students questions to get a better idea of what they are thinking and learning. Encourage them to be alert but relaxed. Discuss and compare students' results. When students' experiments are finished and there is time left in the laboratory period, expect students to stay in lab and use the time to work on their data analyses.
11. Whenever appropriate and possible, answer questions with a question that will stimulate students to find a solution on their own.
12. Ensure that students leave all glassware clean and dry in the drawer from which it was taken.
13. If you are unsure how to handle a situation in the laboratory - waste, spill, or other questions - do not hesitate to call Lori Sims (719-951-5000 x1707).

At the end of the session:

1. Ensure that only disposable glassware has been placed into the white sharps bucket.
2. Hoods, if used, must be cleaned (preferably by the students who have used them) before the laboratory is vacated.
3. Laboratory benches must be left clean, dry, and free of spilled chemicals.
4. Sinks should be clean and free of extraneous items of glassware and/or trash.
5. Any special equipment (e.g., spectrophotometers, pH meters) must be left in proper condition.
6. Be sure that water, gas, and air in hoods and on laboratory benches have been turned off.
7. Go through any additional checklists that are posted in each laboratory for additional responsibilities that you are required to attend to before leaving the laboratory.
8. Check quantities of materials; if anything is running low, please bring it to the attention of Lori Sims.

Planning your first session:

1. How will you arrange the room?

2. Where will you sit or stand?

3. How will you introduce yourself to the group? Will you have an icebreaker?

4. How will you introduce the students?

Conducting the Session: What would you do in this situation?

1. When one person dominates the conversation of the group.

2. When students are having side conversations.

3. When all of the interactions are between you and the students, and there is no student-to-student interaction.

4. Every time you ask a question, the group becomes very quiet.

5. You have one student who rarely talks.

Closing the Session: What do you think?

1. Why is important to provide closure?

2. If you are running out of time, is it important to stop and close?

Other Ideas:

Helpful Hints to Being an Effective PLI

1. **Benefit from your own experiences as a student**
   Recall your own experiences as a student in a class headed by an inexperienced teacher (a graduate student or a young faculty member). Try to remember what was good and what was bad about both the class and the instructor's performance. Think deeply and constructively about how to take advantage of the good points you remember and how to avoid the bad points you remember.

2. **Benefit from lectures that you attend**
   In much the same vein as the preceding point, when you attend a lecture-and you are not so much concerned with taking detailed notes about the content of the lecture for some later examination-spend a little time, as you are listening and observing, just thinking about and analyzing the style of the lecturer. Does that individual speak to the audience, or spend most of the time facing the blackboard or screen? Are visual aids (slides, overhead transparencies) useful and intelligible, or have they been quickly and sloppily prepared? Does the speaker give you enough time to see and understand the visual aids, or does the lecturer race through a seemingly infinite number of visual aids? Does the speaker write legibly and allow time for the audience to hear, see, and write down pertinent points? Is the speaker enthusiastic? Does the speaker speak audibly and clearly? Are there good things about that lecture you could use in one of your own lectures? As someone interested in teaching, I frequently find myself analyzing the lectures and lecturing styles of visiting speakers in these ways.

3. **Be on time**, and preferably early.

4. **Learn to balance** (a) your desire to be friendly and conversant with students and (b) your professional responsibility as a Peer Lab Instructor.

5. Whenever appropriate and possible, **answer questions with a question** that leads the student(s) to the answer for the question they asked. Help the students to think about the objectives of the concept and the procedure for obtaining a solution. Suggest further reading, if needed. Do not simply explain the concept to them! Don’t be afraid to give the students a few seconds to formulate answers.

6. **Listen.** This is perhaps the most important trait an outstanding PLI may possess. Listening not only provides feedback about your teaching style, it also gives students a sense that they have input into the course material. Do not anticipate students' inquiries and cut them off prematurely. Let them ask their questions without interruption. Always be willing to take suggestions to improve the flow of the discussion and the course.

7. **Be Creative.** Creativity assists in the understanding of difficult concepts, and is invaluable. Use various methods to encourage deeper thinking and understanding. Think of creative ways to illustrate a problem, especially methods that involve the students

getting up and moving around. Other examples include illustrations, analogies, timelines, flow charts, etc.

8. **Preparation.** Preparation before arriving at the lecture room or the laboratory is crucial. Educational research indicates that students' opinions about their PLI and the seminar are formed within the first few hours of meeting. This makes the first session particularly important. The first session sets the semester in motion. Consider carefully what you want to do in that first meeting. Moreover, you can never let down in being well prepared. You must be well prepared for overseeing the laboratory experiments, as well as all of the discussion components. One way to prepare for teaching is to visualize actually working with a group of students. Visualize different students asking different types of questions about the topic. How would you answer them? Then spend some time visualizing how you would use the room and the facilities effectively. These actions can do a great deal to minimize the inevitable anxiety that precedes each meeting. Having part of the next discussion planned in advance allows the PLI to inform students of what their focus should be for the next discussion. The 6 P's: Prior Planning Prevents a Pretty Poor Performance.

9. **Be in contact with your students**
   Speak to your students; be sure that you engage their attention when you speak. Speak clearly and audibly, and avoid jargon. Try hard to integrate your students into the presentation of material by soliciting their questions and then responding meaningfully to those questions. Learn the names of your students as quickly as possible. Be available.

10. **Admit ignorance**
    Sooner or later, a student will ask a question that you cannot immediately answer. In such a case, the best thing to do is admit that you do not know the answer. However, it is then essential to do one of two things. First, you can inform the student that you will seek the answer and that you will provide an answer as soon as possible; then, as quickly as you can, consult appropriate books or colleagues to obtain the answer, and report back to the student. Second, and an approach I tend to prefer, is to have the student go with you to your bookshelf or to the library to seek out the answer; in this second scenario, it is best not to take the student with you when you consult with a colleague, because at times you can look rather stupid when a colleague informs you of what might be obvious to him or her but not to you. Finally, as stated earlier, you want to be well prepared so that you do not have to admit your ignorance very often.

11. **Seriousness and professionalism**
    These attributes are obvious traits of a true PLI. You should take the topic seriously and you must behave professionally, if you are to gain credibility with students. If you exhibit these qualities, your students will too, and they will be apt to work harder and to show more commitment. However, exhibiting these qualities does not mean that you should be an individual without humor or compassion.

12. Do not talk down to or belittle students

Talking down to students creates an atmosphere in which the Peer Lab Instructor seems to know everything and in which the students know little or nothing. Instead, it is important for a PLI to treat students as young colleagues, and to nurture an environment in which PLI and students together are on a collective quest for knowledge. It is catastrophic to student morale if PLI tells students or otherwise makes them think that they are inferior and stupid. You will never profit from announcing that a particular student question is stupid or that the student is stupid. Although students certainly do not know everything and certainly have much to learn-as we all do-your challenge as a PLI is to advance the students' knowledge and their abilities to learn and to teach themselves. Finally, never criticize or belittle a student.

13. Attitude

Behave as if you are important, and treat your students as if they are even more important. Believe, and demonstrate by your behavior and actions, that what you are doing is very important, and you should find that your students will take the same attitude.

Working with Students - DO's and DON'Ts

- DO be enthusiastic. Enthusiasm and a perception that you care can atone for many sins. Students who think that the PLI is trying his/her best and that the PLI cares about them and the module tend to be very forgiving when it comes to many common PLI blunders. Conversely, students who think the PLI is a joke and does not care about them or the class tend to judge the PLI too harshly.
- DO say “yes” to students’ requests whenever it is reasonably possible to do so.
- DO make an extra effort. Have extra discussion questions ready.
- DO admit if you don’t know an answer. Offer to help them find the answer, or to refer them to someone who does.
- DO answer questions with a question.
- DON'T be afraid to make mistakes. They are going to happen, deal with it. Remind the students that you are as human as they are and that you are prone to make the occasional mistake.
- DON’T allow yourself to be drawn into an argument with students.
- DON’T demand that students have to defend themselves to you. If they miss a module, or are late, respond with a smile, and “It’s nice that you came.”
- DON’T say anything that would make you sound like an authority figure (e.g. parent, teacher, police officer, judge, etc.).
- DON’T feel obligated to solve problems or challenges that students can solve or figure out for themselves.

Above all, students should always feel welcomed, accepted and supported by PLIs.

Emergency Response and Waste Disposal Procedures

1. Safety Regulations

- PLI's should tell the students that safety goggles are always available, and should be used when in the lab.
- Emphasize that students should wear protective clothing, including goggles, when appropriate in the lab.
- Students may not be in lab if a PLI is not present. PLI's may not leave lab if students are present.
- Explain to students that in the event of an emergency, you may ask any of them to make emergency phone calls and to wait outside the building to wave down an emergency vehicle.

2. Responding to an Injury

- Be calm.
- Stay with the injured person. If it is necessary to call emergency personnel, send a student to make the phone call. Only leave the injured person if staying puts you at risk of injury or loss of life. Only move an injured person if absolutely necessary.
- In case of minor cuts and burns, students should report them immediately to their instructor. Minor first aid treatment can be given within the building. If a minor injury requires medical attention, will be called for a Brooklyn College Police Officer to pick up a student and deliver him/her to the BC Health Center ( ) or Hospital Emergency room (other hours).
- If a person is seriously injured, no attempt should be made to move the person unless absolutely necessary, such as in the case of a fire. Call 911 immediately. Then call Lori Sims (718-951-5000x1707). The PLI should stay with the injured person until help arrives.
- Report any injury (regardless of severity) to Lori Sims (718-951-5000x1707).

- Emergency Numbers
    - Fire-Police-Ambulance **911**
    - University Police **x5444 or x5445**
    - Brooklyn College Health Clinic – **x5580**
    - Emergency Medical Squad – **x5858**
    - Non-Emergency Medical Squad – **x5859**
    - Environmental Health & Safety – **x5400**
    - Personal Counseling – **x5363**
    - Facilities – **x5885**