

Teaching Bioethics and Professional Conduct Through Problem-Based Learning

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Abstract

Many federal agencies require graduate students, post-doctoral fellows, and undergraduates receive Responsible Conduct of Research (RCR) training. An effective program teaches functional ethical decision-making skills students can use when there are no formal rules. Instructors can provide effective RCR/professional ethics training using Problem-Based Learning (PBL). We developed a course that leads students through cases highlighting specific professional conduct issues they likely will face in their own career. By selecting different cases, the course can be adapted to meet the learning goals and suit the interests of a wide variety of audiences, from non-majors to graduate students.

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Introduction

There are many reasons for teaching students principles of bioethics and professionalism, and nearly as many different audiences. Often undergraduates are most interested in bioethical issues from a philosophical point of view. They become very engaged when a course lets them personally wrestle with larger issues like the role and responsibilities of science in society. For example, most undergraduates easily could be drawn into a discussion of the ethical responsibilities of scientists engaged in “dual use” research, that is, work that could be misused to harm the public. A typical scenario to discuss with this group might be the recent recreation of live polio virus from DNA fragments. What are the ethical implications of publishing the methods used to recreate polio, given that they could be abused by less ethical individuals and lead to global re-emergence of this disease? Should there be limitations on what science professionals are allowed to do?

In contrast, graduate students exhibit variable engagement with discussing broad ethical questions, but will engage readily in discussions of professional conduct issues that could negatively impact their research progress or career success. Some of their concerns are addressed in some way by federal guidelines for responsible conduct of research (RCR). For example, most institutions with graduate programs have formal rules regarding who should receive authorship on primary research. Yet almost every faculty member can tell anecdotes of being denied (or knowing someone who was denied) authorship on research papers while they were graduate students, or of being pressured to give “courtesy authorship” to individuals that were undeserving. Who is responsible for ensuring that institutional, journal, and federal policies are followed? Other research and professional concerns of graduate students may not be addressed by institutional or other regulatory agencies. For example, suppose a lab PI decides to change from cell culture models to whole animal studies. Does a graduate student in that lab have a right to voice a conscientious objection against the new research methods? Can that student be compelled to use the new methods to complete their degree? If they

change labs, should the time allowed for financial support by federal agencies or the institution be restarted?

There are many tools and resources that students can use to explore and resolve thorny ethical and professional issues like those just described. The problems that instructors face are how to:

- 1) Introduce students to these resources, tools, and thinking strategies,
- 2) Provide students with a safe instructional environment in which to practice using them, and
- 3) Make such a course engaging for very different student audiences.

This workshop demonstrates a modular Problem-Based Learning (PBL) curriculum that can be used to teach practical bioethics and decision-making skills to students at all levels. The course format is modular, so depending on the cases that are used it can be adapted to suit the learning needs and interests of a wide variety of students. The workshop authors have developed a library of 16 PBL-ready cases thus far, and new cases are being developed. In Fall 2009 the presenter's institution will be launching a shared electronic workspace for collaboration and dissemination of course materials. Assessment methods that are robust and well validated have already been developed and are available as well.

General Format

In this workshop, participants explore an abbreviated demonstration a case that the authors developed for a biomedical graduate student Scientific Professionalism curriculum, which was repurposed for a general graduate student orientation. They will work in small groups to experience the case and learning process from the students' perspectives.

In the second half of the workshop, participants will learn how cases are developed, as well as how a PBL course is managed.

Student Handouts

Case: Graduate Life

Handout 1:

SCENARIO:

You are 23 years old, with a B.S. in biology, and just got engaged to a high school teacher. You've been working as a field technician for the state Wildlife Resources Commission for two years, and are fascinated by the work. You are considering pursuing it further, but need either a masters or a Ph.D. in physiological ecology.

Luckily, Dr. Ellen Thompson is a professor at nearby Draykall–Lindham University (DLU). She is well respected for her field and lab expertise; you even used some of her protocols while working for the state. You could take graduate courses and study under Dr. Thompson without having to move, a big plus for your personal life.

You contact Dr. Thompson and she invites you to interview for a graduate position that is supported by her grant, and to apply for a slot in the DLU Environmental Sciences program.

TASKS:

- Summarize the facts of the situation so far. Given those facts, what questions would you ask during this interview?
- What else do you want to know?

Handout 2:

SCENARIO:

The interview with Dr. Thompson goes extremely well and you send in your DLU graduate school application. In early May you receive an offer to join the master's program, along with a personal invitation from Dr. Thompson to work in her lab.

The bulletin says most students in the Enviro–Sci graduate program start out as teaching assistants (TAs), but on the phone later that day Dr. Thompson assures you that it is not unusual for a grad to start out as a research assistant (RA), or even stay on as an RA for their entire time.

She adds, "If you want to start now, I can pick up your stipend right away on one of my current grants. With your work experience, you could set up field studies now and collect data this summer and fall. You wouldn't have to wait until next spring."

Her suggestion is very appealing; starting early might reduce the time it takes to complete your degree, and ease the financial strain of returning to school.

You give your 2 weeks' notice to the state, and in early June start in Dr. Thompson's lab. It is a great fit and your summer fieldwork goes smoothly.

TASKS:

- What possible advantages and disadvantages do you see in these arrangements?
- Is there anything else you would want to know at this point?
- Are there any red flags for you in this situation so far?

Handout 3:**SCENARIO:**

It is early September now, two weeks into the semester. You come into the lab after class and find that everyone is very agitated. You ask Susie Zhan, the technician, what the fuss is all about.

“Ellen has been offered an endowed chair at Montclair University.”

“What? Where is that?”

“On the other coast—three thousand miles away!”

Dr. Thompson pokes her head out of her office, see you, and calls you in.

“I wanted to tell you that I’ve accepted a new position at Montclair. I want the whole lab to move there with me. The lab will be packed and moved this semester, so we can be up and running again by January.

“I spoke with their graduate director, and you and my other 2 students can join their graduate program. It’s too late to start this semester, but you could begin classes in spring, or even wait until next fall.

“I also got a great start-up package with funds for state-of-the art equipment you can use for your project. I’ll just hire you as a technician until you start the graduate program.”

The phone rings and Dr. Thompson hustles you out of her office. As you wander back to your desk, Susie walks over and puts a hand on your shoulder.

“You okay? You look about as bad as I feel.”

“Susie, I can’t go. My fiancé is here. I’ve started my research project already.”

“I know. I’ve been with Ellen for 9 years, but I am not going either. Well, at least we’re still in a very good department here at DLU. There are several other faculty who would make great mentors.”

You point out that no one else is a physiological ecologist, and the whole reason you enrolled here was to work with Dr. Thompson. Also, you do not know if DLU’s Environmental Sciences graduate program can pick you up since you were admitted with the condition that Dr. Thompson was paying your graduate stipend.

TASKS:

- What are the advantages and disadvantages of accepting Dr. Thompson’s offer to go with her to Montclair University, versus staying at DLU to work and study with another faculty member?
- Who are the stakeholders in this situation? What are their goals and expectations? What are their responsibilities and obligations?
- Which of the goals, expectations, etc., you just identified are reasonable for a member of the scientific community? Which goals, etc., are NOT reasonable? Why?

Handout 4:**SCENARIO:**

It is late October, and the old lab is empty. Your desk now is in a department equipment room, and you feel completely alone. You are unable to focus on your required course reading and your mind wanders during class. Adding to your stress, Dr. Shelby, the graduate director for Environmental Sciences, calls you into his office.

“We’re concerned about your failure to choose another faculty mentor. You’ve already lost half a semester to your classmates. I know you wanted to work with Dr. Thompson, but ‘good science’ is ‘good science’, regardless of what the project is.”

“You need to get moving because, frankly, Dr. Thompson left you in a difficult situation. Our graduate class was full last April when you applied but we decided to admit you based on her enthusiasm for you.

“I stressed to the Graduate Dean our responsibility to you, and stretched our budget to pay your stipend this first semester. Unfortunately there are no TA slots available for spring, so to stay in the program you must find a lab that can pay you as an RA.”

As if that were not enough pressure, Dr. Shelby adds,

“Don’t forget you are on the master’s track. You need to decide who will be on your thesis committee as well.”

“Great,” you think, “one more mindless detail to think about.”

You begin visiting other departmental faculty. First up is Dr. Ott, who published some work with Dr. Thompson, but she is unenthusiastic and somewhat aloof. The lab is cluttered with old, unused equipment, and the research seems stagnant, even from your perspective as a first year student. However, Dr. Ott is well funded by NSF and she assures you she can support you for your whole graduate school career.

Next you visit Dr. Tomas Gutierrez, a chemistry faculty member cross-appointed to the Environmental Studies program. In your mind, “Dr. G” is the obvious choice. He came to DLU three years ago from a government geochemistry position, so his lab is new and he is excited about his research, but there is a catch. Dr. Gutierrez has a small amount of startup funds remaining, so he can only support your stipend for the next semester or two.

TASKS:

- What else would you want to know at this point?
- Who are the stakeholders in this situation now? If they are the same, have their goals, expectations, and responsibilities changed in any way?
- If there are new stakeholders, what are their goals and expectations? What are their responsibilities and obligations?
- Which of the goals, expectations, etc., you just identified are reasonable for a member of the scientific community? Are any of them NOT reasonable? Why?
- Are there any new red flags for you in what has happened?
- Given what has happened and what you know, how would you proceed?

Handout 5:**SCENARIO:**

It's December, and final grades are in: despite all the drama and distractions you have A's or B's in every course. Dr. Gutierrez formally arranged for you to join his lab, and you enrolled in spring classes.

Over dinner, a friend from class suggests you leave the masters program, and go for a PhD instead.

“Why not? Your grades prove you can do the work, and you already have a lab lined up. It's only another couple years, and think of the professional doors it will open. What are you gonna do, move somewhere with your fiancé and start school all over again?”

You had been thinking about a Ph.D., and even considered moving to Montclair and working with Dr. Thompson after you got your masters. Going for a Ph.D. now would let you spend more time doing the kind of research you wanted, but you just don't know...

TASKS:

- What are the differences between a master's and a Ph.D. degree program?
- What other information would you want to know at this point to make your decision? Where would you go to get that information?

Notes to the Instructor

(The following materials were taken from the WFUSM Scientific Professionalism Course Facilitator Guide, which in turn was adapted from the facilitators guide developed for the WFUSM medical curriculum)

What is Problem–Based Learning?

Many ethics courses use case studies. What makes the program that inspired this workshop unique is that students approach cases through a specific group instructional process called **problem based learning (PBL)**. The PBL teaching method has been used by medical centers since the 1980s to teach clinical science to medical students, and the majority of medical schools in the United States make at least some use of the PBL approach (Daggett and Houston, 1998). PBL also is used in a variety of other institutional settings. Two fundamental ideas form the basis of PBL: 1) a student learns best when they are active participants in the learning process, and take the lead in identifying and locating relevant information; and 2) students learn more effectively in groups than alone.

Details of the PBL process are explained in a later section. For now, it is enough to know that students in PBL courses learn by working through case scenarios in stages, in small groups. At each stage, the group must decide what they know as **facts**, what they **would like to know**, and what essential pieces of information (**learning issues**) they would need to know to continue. Within a small group format, each student is encouraged to 1) articulate his/her own understanding of the problem(s) in each case, 2) identify what information is fact-based, and 3) start the process of determining what additional information is needed to work towards a resolution. Small groups promote collaboration with peers and foster development of effective teamwork skills (Lambros, 2004).

In PBL, learning is self–directed. The group identifies the issues raised by the case and works to resolve them. **The facilitator is NOT the expert resource.** Rather, the facilitator guides the group during the learning process. Later sections describe in detail how a facilitator fulfills their role as “guide on the side” for a small group. PBL courses:

- Promote discussion of prior knowledge
- Encourage cooperation, collaboration, mediation, and negotiation
- Promote discussion for understanding
- Promote self-direction and interdependence
- Promote research and inquiry
- Foster discerning judgment of resources.

PBL is a thoroughly validated instructional method. Time and again it has been shown to produce greater learning gains than didactic lectures (Lambros, 2004). Yet those who have never experienced it often do not believe it will work. It is true that, if implemented improperly, it can be a very disappointing experience. This guide explains how to use PBL correctly, and troubleshoot the most common problems. It is also true that facilitating a PBL course is more challenging for instructors than traditional didactic lectures. In a lecture, the instructor feels they have good control of the pace, direction, and types of learning that occur. Ironically, educational research indicates that, while lecturing may feel more comfortable for the instructor, the amount their students learn is less, the information learned is retained for less time, and students are less able to use it (Lord, 2007a,

2007b). A PBL facilitator must be able to adapt and let the learning process happen at its own pace. The reward is deeper and more useful learning.

Those who have not used PBL often are concerned about how to assess students. Fortunately, the format has been used for so long that scoring rubrics and assessments have been developed and are widely available. Later sections explain how to evaluate students, and provide sample grading rubrics and guidelines for using them.

Using PBL to Teach Ethics and Professionalism

In the context of an ethics and professionalism course, PBL lets learners solve authentic, “real world” problems. The course goal is to shape graduate students into professionals with a high commitment to professionalism and social responsibility and to provide graduate students with tools to ethically navigate the complex and rapidly evolving academic and societal environments. Skills include: 1) recognizing ethical issues in the practice of science, 2) developing sound moral reasoning, 3) developing skills for effective group or team work, such as clear communication, facilitating discussion, and constructively critiquing others’ concepts 4) developing self-directed learning skills such as applying new knowledge, and 5) articulating and defending one’s professional judgment with reasoned arguments. In addition this course fulfills federally mandated requirements for **Responsible Conduct of Research (RCR)** training and human subject protection training.

The modular course format makes it extremely flexible. Depending on course goals, an instructor can select cases that:

- Teach participants specific federal or institutional rules and regulations
- Introduce cultural-specific norms
- Highlight scientific professional obligations
- Explore moral reflection such as professional ethical reasoning, e.g. points of ethical conflict, principles, obligations, & consequences of a chosen course of action
- Emphasize RCR instructional areas or ethical issues and philosophies within the practice of science

Cases can take different forms. In the course that inspired this workshop, each case is explored in 2, two-hour sessions that typically occur 5-7 days apart. In Session One, the case scenario is introduced and the group collaborates to identify key learning issues. Each student works individually on the identified learning issues between the two sessions (**self-directed learning**). Each student is expected to work independently on the learning issues arising from Session One. The goal is for students to develop skills such as finding appropriate resources, problem solving, and formulating well-reasoned justifications for decisions. Students are required to document their self-directed learning by turning in concise written assignments. At Session Two students share knowledge acquired during their self-directed learning activities, and use it to explore in more depth issues introduced by the case and to further develop effective teamwork

Promoting moral reflection

Many ethics-related cases look strictly at facts of an historic situation, or specific decision-making processes. Our PBL cases are designed specifically to promote **moral reflection** by students as well. Four types of moral reflection can be stimulated (though not necessarily all in any one case): moral sensitivity, moral reasoning and judgment, moral motivation and commitment, and moral

character and competence (Bebeau, Rest, & Narvaez, 1999, Rest, Narvaez, Bebeau, & Thoma, 1999).

- **Moral sensitivity** is the ability to see things from the perspective of others and be aware of legal, institutional, and national concerns. Teaching strategies in this context include presenting situations where the ethical issues have not been predigested or interpreted. Students will need to be aware of nuances in the case scenarios and sort through relevant and irrelevant information in order to focus on pertinent customs, rules, regulations, and laws. One means of highlighting moral sensitivity is asking students to consider something from another's point of view. The goal is to promote sensitivity to ethical issues that are likely to arise in research settings.
- **Moral reasoning and judgment** involves learning ways to weigh the principles, values, and consequences embedded in moral judgments. The teaching strategy here is to force a choice or decision to assure eliciting **reasoning rather than problem solving** with several possible solutions. Students will be prompted to defend their choices by supplying the criteria for their judgments. Two useful approaches or methods for developing moral reasoning were taught.
 - The first approach is "Developing a Well-Reasoned Response to a Moral Problem in Scientific Research Ethics" (Bebeau, Pimple, et al. 1995). It provides a framework to construct and evaluate reasoning processes in moral problem-solving. The framework requires identifying the **issues and points of conflict, interested parties** (also called the **stakeholders**), **consequences**, and **obligations of each stakeholder**.
 - The second form of moral reasoning (adapted from Iserson, 1999) is to pose three questions:
 - **Impartiality Test:** would you be willing to have this action performed if you were in the other person's place?
 - **Universalizability Test:** would you be comfortable if all scientists with the same background and in the same circumstances act as you are proposing to do?
 - **Justifiability Test:** are you ready to state openly to your peers, superiors, or the public your reasons why you acted as you propose to do?
- **Moral motivation and commitment** aims to develop a sense of professional identity. Teaching strategies here will include asking students to explain what their obligations as scientists are and providing the students with exemplary examples. The goal is to instill a sense of personal identity that incorporates the norms and values of the science and engineering culture.
- **Moral character and competence** reflects a focus on personal skills such as interpersonal interaction and problem-solving. Teaching strategies include role-playing exercises. The goal is to build competence in problem-solving and interpersonal skills.

The Role of Facilitators in the Group Learning Process

Facilitators **must** remember that the goal of the PBL format is for students to find much of the required content knowledge between the first and second sessions of the case. This is one of the most difficult adjustments most instructors have to make. The specific content objectives within

PBL-ready cases will be outlined in a set of **Facilitator Notes**. However the content objectives outlined in the Facilitator Notes for each case are NOT obvious to students while they are in the middle of a case. The facilitator does not need to provide the content. Rather, ask questions that encourage students to discover the content for themselves, or that encourage students to identify the hoped-for content as learning objectives that they must find for themselves.

The facilitator is not a bystander in a PBL course. They serve several important roles. Their primary role is as a **cognitive coach**, whose goal is to help students:

- Acquire process skills for self-directed and life-long learning
- Acquire essential skills in moral reflection and moral reasoning
- Develop professional skills for negotiation, collaboration, mediation, and effective communication
- Be accountable for their own learning
- Demonstrate good content acquisition skills and related professional behaviors

At the start of a PBL course, most students show little evidence of these abilities. This is normal; an effective facilitator will be slightly more directive early in the process and become less so as the course proceeds. It might be helpful to think of a novice baseball player. The coach is there to assist in choosing the right bat, determining the best stance, instructing how and when to swing, managing practice sessions, and eventually managing the play of the game. However, the coach doesn't actually hit the ball during the game, and as the player gets better, the coach will provide less general instruction and focus more on specific skills that need improvement.

As a cognitive coach, the effective facilitator demonstrates these characteristics:

- Monitors the group to ensure a balance of student contribution
- Monitors group functionality and group dynamics
- Encourages exploration of new content and learning issues
- Encourages discussion as a way for students to demonstrate content acquisition and conceptual understanding
- Uses numerous prompting questions such as “say more about that”, “tell me what you’re thinking”, “does everyone agree with that explanation”
- Does not ask leading questions or use directive statements that push the group to a defined conclusion
- Encourages appropriate strategies for use of small group time
- Makes suggestions that help students consider all available options
- Acknowledges strengths and weaknesses of team members
- Monitors for “team” functioning of all group members.

Students must recognize their responsibility as a group or team member in a PBL format course. Individual students are jointly responsible for ensuring that the group functions properly. The skills they learn now as a group member will serve them well in the future, when they are likely to be asked to function as part of a collaborative team. As their **group manager**, the facilitator is responsible for holding students accountable for meeting these responsibilities.

At other times, the facilitator's role will be to serve as a **role model**. This would be analogous to a coach demonstrating the batting stance or sharing a story from his own playing days

when a particular strategy was effective. As role model, the effective facilitator demonstrates these characteristics:

- Shares appropriate personal experiences that align with small group discussions
- Provides experiential insights about how to go about “task” at hand
- Role plays with students or for students when appropriate
- Demonstrates strategies and approaches for dealing with “difficult issues”.

On rare occasions it is appropriate for the facilitator to take on the role of **expert resource**. This role should be used judiciously, such as when the group is stuck and you recognize that supplying a **small** amount of content would move the process along. As expert resource, the effective facilitator demonstrates these characteristics:

- Takes a 2-minute time-out to be “the expert” explaining a difficult or unfamiliar concept that is causing an obstacle to discussion.
- Refers students to specific content resources that they might miss.
- Delivers appropriate “mini-lectures” on occasion, which are never more than 3 minutes in length.
- Describes relevant experiences in your specialty area.

Typical Group Sessions Described

If you are a first time facilitator, this section can help you anticipate how group sessions are likely to go. There is nothing fixed about this description and you should expect some variation. The sections are written assuming that the class is following the typical strategy of having two meetings per case.

First Session

The first session of each case is presented in a page by page sequence. At the top of each page may be a printed time; this is an average time that a group should spend on that page or section. If you go a little longer or shorter, do not be too concerned. Each group works at a slightly different pace.

When you start, ask a group member to read the material aloud (pick someone, don’t ask for volunteers). Reading the scenario aloud focuses everyone’s attention. You will do the same thing for each page.

Page 1 serves to establish the case scenario, introduce some or all of the stakeholders, provide a very brief introduction to a dilemma and/or central concept, and provide an invitation to brainstorm. Prompting questions or tasks at the end of the page require that the student begin discussing the case and put themselves in the case as a stakeholder. For example, in the demonstration case, Graduate Life, the protagonist in the case has been invited by a well-known professor to interview for a graduate position that is supported by a grant. In the first task, students are asked to review the facts presented, then discuss how they might approach a similar situation. As part of this first case, students are asked to identify potential explanations for the chief issue or problem related by the case. At first, students will not provide very detailed or elaborate responses, or their responses will be poorly explained or thought out. This is normal, since they have very limited research experience or content knowledge to draw from. They will get better and better at this over time.

Page 2 contents serve to further unroll the case, provide more details, fully lay out the central issues, and begin to identify areas of potential tension between the stakeholders. The students should continue brainstorming with a focus on the larger ethical issues. Questions will prompt them to discuss obligations and roles of the various stakeholders. By this point, students should be identifying and listing potential **Learning Issues**, that is, issues which are not answered by the case, but which they need to know to solve the problems which are raised. For example, in the demonstration case, students are prompted to discuss what it means to be supported by a mentor's grant, how various sources of support might affect a student's ability to rotate through different laboratories, and the pros and cons of lab rotation. **It is vital that at least one student act as a recording secretary, and write the learning issues down, either on paper or (preferably) on the board. Do not skip this step.**

Page 3 contents provide additional descriptive information, reveal unexpected twists and turns, significantly increase tension between the stakeholders, and provide a basis for deeper moral reflection. The group should continue to discuss the situation and different approaches to resolving it. There is no correct answer, so the group shouldn't be encouraged to come to a consensus but rather develop respect for different perspectives. They will likely identify additional learning issues as well.

Page 4 contents serve to provide directions for issues to be researched for the second session, direct students to finalize their learning issue list for the next meeting, and establish specific students assignments to be completed before the next meeting, including written assignments for some cases.

At the end of the first session for a case, students are given an assignment to complete for the second session. It may be verbal or written, and requires them to learn about the different aspects of the case and identify relevant resources. They may be asked to propose additional approaches to the moral dilemma and/or professionalism concept. The students should agree on their final learning issues list for the day (it may get longer with discussion) and come to consensus on how they will address this list (who will research what, or if they will all research every item). Early in the course it is especially important to have students identify their next steps and what resources they plan to use during their time together.

At the end of the first week's session, it is also extremely important to spend 10 minutes or so assessing **group process** for the session that is now ending. Ask: what worked well? What can be improved? Have the students respond individually and insist they be specific. This increases group function dramatically.

Between Sessions

Between the first and second sessions, students are expected to pursue the learning issues identified in the first session on their own, and acquire new content that they are prepared to share with the group and discuss in the second session. Requiring written assignments provides greater accountability for each student and a way for facilitators to assess independent learning.

Second Session

When the group meets again the following week, the second part of the case is launched as before. Individuals read aloud, and work through the questions given.

Page 1 content serves to guide students' discussion of learning issues and presentation by each student of information acquired and resources used. This step may take as much as an hour.

The group's focus at this stage should be on resolution of confusion & uncertainty from the prior session. Encouraging discussion about the credibility and usefulness of sources is also important. This discussion may generate new learning issues as students see the limits of their understanding. Students should keep a running list of their new learning issues and any ideas they have as to how they might pursue them. (Case journals, a listing of the facts of the case and learning issues, can be a useful motivating tool here, if students are not making the effort on their own.) **Page 2** contents serve to guide the group discussion in the second hour, present additional material, and facilitate review of earlier issues and approaches to resolution.

When wrapping up a case on the second day it is important to again facilitate a **group assessment of function and process** and **group assessment of achieving the objectives** for the case. Ask the students what they identify as the case objectives. After the group self-discovery, match their self-assessment with the expectations of the case developers. Have the group identify why they achieved learning the objectives or why not, how the group function or the case could be improved. Encourage students to give you specific feedback as well; what did you do that was particularly helpful or not so helpful. For example, ask the students how you can better facilitate the group process or give meaningful feedback to the students. Students will be evaluating the facilitators at the end of the semester; get their feedback now so you can improve during the course.

Sample Prompting Questions

A highly functional group can become nearly autonomous; we have heard anecdotal reports of groups that worked so well together that they did not require significant input from their facilitators. However, a group must learn through practice how to work together this well. Until the group becomes self-directing, the facilitators will need to guide their learning process. This is done by asking **prompting questions**. Several examples of prompting questions are listed below. These questions are designed to engage students, facilitate the process, and keep students on track. Many of them can be used at more than one time.

- What would it be helpful to do/ know now?
- Is that a learning issue?
- How do you know that?
- What does that have to do with this problem or situation?
- Does everyone agree with that statement?
- Where are we stuck?
- Does the group agree what the next step should be?
- Tell me more about what you are thinking?
- Stuart (or Sandra, or whoever), you haven't said anything lately, Do you agree/disagree? Why?
- Where can you find that kind of information?
- Someone summarize where we are right now. Does everyone agree with that?
- What do we agree to do between now and the next time?

Other Facilitator Behaviors

The role of a facilitator in the learning process is quite different from the instructor's role in a traditional class or lecture setting. The following hints and strategies are offered as suggestions for how to develop a good mindset for facilitation.

Positive behaviors to use often:

- Count to 10 before intervening.
- Make notes to yourself before intervening.
- Give students time to self-correct before you do it for them.
- Be in the problem with them not as an observer who knows how it turns out.
- Empathize; this is not what they are used to doing.
- Be patient and let them make mistakes. Learning involves some positive failure. If we do not fail at something chances are we already knew it so are not learning from the experience.
- Help them discover how to correct mistakes or avoid the same ones in the future.
- Get excited with them, do be part of the group, do enjoy all the learning that will happen.

Negative behaviors to avoid:

- Don't take the problem away from the students by being too directive.
- Don't send messages that they are doing the "wrong" thing or thinking the "wrong" way.
- Don't give them too much information because you are afraid they won't find it.
- Don't intervene as soon as you sense they are going off track. Remember, mistakes are okay.
- Don't rush them, especially in the beginning.
- Don't be afraid to say, "I don't know that."
- Don't be afraid to say, "That sounds like a learning issue" instead of telling them the "answer".
- Don't become the expert because you have the information they need to find.
- Don't talk just to fill uncomfortable silence.

Be patient, but proactive. The PBL format has been thoroughly validated, and works extremely well. However, it takes time. Groups progress at different rates. Experienced facilitators can tell you about groups that came together almost instantly, while others took much longer. As long as the group functions well, its members **will** make progress towards the course goals.

Troubleshooting Group Process

If your group really is **not** functioning well, do not just chalk it up to "a bad group." The facilitator is responsible for taking active steps to correct the situation. At the end of cases, ask your student group what is not working, and how they propose to correct it. Ask to observe another group while it is in session. Discuss the problem with other facilitators. Seek advice from others that teach a similar type of course. There **are** solutions to most group problems, but you as the facilitator must make the effort to find and implement them. The most common trouble areas with small group function, and facilitator strategies for counteracting them, are described below.

The Quiet Student

- Ask a persistently quiet student questions directly but use prompters rather than content driven questions. For example, "Do you agree with that?" "Can you summarize what we know so far about the case?" Another tactic is to ask the quiet student to be the scribe, which engages them more directly in the process.

- Tell the entire group that they cannot be evaluated unless they contribute and demonstrate in the sessions what they are learning outside the group.
- Tell a quiet student that, while this is harder for some than others, it is a necessity. Scientists must communicate in groups all the time, demonstrating what they know and understand about research cases.
- Make the group accountable for equal participation of all members. Let the other group members serve as mentors for the quiet individual. You do not have to be the only monitor.

The Dominating Student

- Tell the group (or the individual in private) that more is not always better—all group members must have an equal chance to participate. Students who interfere with this process should be stopped. You must demonstrate how to do this appropriately and then make the students accountable for correcting or encouraging proper group behavior themselves. It may take more than one demonstration and they may have to be reminded.
- Share with the dominating student that you realize that they know a lot of content, or are doing a lot of work outside of group but that you need for them to be responsible for enabling equal contributions among all the group members. Let them know that you will evaluate them accordingly.
- Ask the dominant student to serve as a facilitator. This forces them to listen rather than talk incessantly.

Students Get Off Track

- Ask students things like, “What does that have to do with this case/scenario.”
- Require them to relate their conversations to the current problem or case. When they cannot, have them summarize the current problem, where they are with it, and where they are headed with it.

Students Demonstrate Inaccuracy

- Novice facilitators often think students demonstrate inaccuracy more often when taught using PBL. In fact, formative assessments will show that students demonstrate about the same rate of inaccuracy in a lecture course. The difference is, inaccurate understanding is more obvious in the small group setting.
- Facilitators should remember that not all inaccuracy is bad. Most of us would agree that we learn a great deal from making mistakes. Students can only go so far with inaccurate information in problem resolution. It is a more powerful learning situation when students must self-correct, rather than simply correcting them. Let students make some mistakes, and gain insight from having done so.
- If students do not self-correct after some time, probe their inaccurate evidence using questions such as, “Where did you come across that? What is your source? That’s not quite how I understand it—does everyone else understand it that way?”

Students Openly Resist the Group Learning Process

Resistant students will avoid listing learning issues, engaging in conversation, or reporting on what they learned. Students will participate superficially or do not appear fully engaged in the group. When this happens:

- Make it clear to the group that this is not acceptable. Part of the evaluation is the quality of student contribution. The group members should also be made accountable for communicating this to other group members when they feel it is insufficient. One caveat is that some students are much stronger written communicators than oral ones. If students need time to process ideas, they often are stronger writers. Do not penalize students who have different learning rates or learning styles, **as long as they are contributing** to the group’s progress in at least one of these ways.
- Students focus on a simple solution rather than trying to understand the underlying issues that led to the situation. Prompt them to explain issues besides the obvious ones, i.e., what goes on at the cellular level, home environment and compliance or maintenance, relate their own professional values to the ethics presented.
- Engage a resistant student much as you would a quiet student by having them scribe or by asking them prompting questions.
- Often resistance comes from students thinking these situations are unrealistic. Remind students that each of these cases is taken from real situations that the faculty and student authors have faced in their professional lives.

The Group Does Not Mesh Well

Students have professional and personal lives together outside of these courses. Social tensions, personality differences, lab conflicts, or any number of other factors originating outside of

your group meetings can undermine its ability to work well together. If this occurs, use it as a mentoring opportunity.

- First and foremost, do not ignore this problem. It will not self-correct. You must help the group overcome it.
- Tell the students that our profession often requires us to work effectively in groups, regardless of our professional or personal differences. Learning to overcome these barriers in a positive way is an important professional skill.
- Follow up on the preceding suggestion by helping students pinpoint specifically what is not working well for them and for the group.
- You must model that it is important to determine what has to happen to function at a high level as a group. Teamwork is an important professional activity, and a poorly functioning team is not effective.
- Have the **students** decide how to make this better for everyone.

Methods & Rubrics for Evaluating Small Groups

As a facilitator, you must evaluate individual students for their small group participation and contributions. Fortunately there has been considerable prior work done on assessment in PBL; it is not necessary for facilitators to invent assessment procedures themselves.

What Should Be Evaluated?

In PBL course evaluation there should be more emphasis placed on the learning process than on factual content gained. Both quality and quantity of contribution and participation are equally important. You will also be evaluating the function of the group as a whole; this will be included as part of each individual student's grade.

In evaluating students, you should focus most of the attention on assessing their developmental progress, not their current proficiency. The students will probably start at nearly ground zero and demonstrate a reasonably sharp increase in skills over the time of the course. If you develop concerns about a student's development in any one of the domains we are assessing, do not wait until the assessment meeting to provide feedback to the student; provide it as soon as is practically possible. If a student consistently causes you concern in the knowledge acquisition domain because they fail to demonstrate any new content during group discussions, tell them as soon as you are aware of it so that they can self-correct. If you are consistently concerned about a student's communication style because they are abrupt or obstinate, describe this to them as early as you notice it.

Both the formative (in-progress) and summative (end of course) assessments of students are conducted using a standardized **evaluation form**. There is no specific formative assessment process for the facilitators, only a final assessment. However, facilitators are encouraged to conduct formative assessments on their own to determine if there is anything they can do to improve the learning process for their students.

Formative Assessment Meetings

As each case is completed, the facilitators for the group should meet and use the current Student Evaluation Form to assess each student in the group. Both facilitators should agree on the

score for each section on the form. Also, do not just mark scores; make comments that can help students improve. Include positive comments about what they do well too.

After completing 2-3 cases, the two facilitators should meet with each student individually for 10–15 minutes to assess the student's progress towards the goals of the course. Before this meeting, have the students complete a Student Evaluation Form on themselves, and bring it with them to the meeting.

During the meeting, compare your scores for each student with their own self-scores. Discuss your reasons why you scored them as you did. It is particularly effective if you can provide specific examples to the students showing why the scores are what they are (regardless of whether they are high, mid-range, or low scores). This is easier to do if you keep brief notes about students' actions during the sessions you facilitate. For example, if you describe to a student that they received a low score because the hypotheses they generate are too vague, give an example of a vague hypothesis they offered. Likewise, give specific reasons for their high score, such as they try to enlist all group members in group discussions, or they try to move the group along when they get stuck on something.

If the student has more specific problems (quiet, dominating, etc.) this meeting is a good time to address those issues. Make specific suggestions for improving in the future.

Suggest ways for students to improve their scores in each of the areas on the evaluation form. If they do receive a score of "4", remind them that there is a sliding scale of expectation and the same level of performance in that domain may not result in a "4" score several weeks from now. The expectation is that they get better and better at each of the criteria throughout this component of the course.

The Summative Assessment (Grading) Process

At the end of **each** case, the facilitator(s) should determine the scores for each student using the Student Evaluation Form. A sample form is reproduced at the end of this document. If there are two facilitators, the scores on the form should be a consensus between them.

Make copies of the completed form, and give one back to students at the start of the next case. This way, students know exactly how they are being scored. This is in addition to (not instead of) the formative assessment meeting.

Grading Criteria and Format

Students' grades for each case, and for the courses overall, are based on four criteria; three are used to assess the individual student, while the fourth is shared by all members of the group. Remember that one of the objectives of this course is developing teamwork skills. The single shared score makes all members of the group jointly responsible for its success.

For each of the four criteria, the evaluation scale is "0, 2, 3, 4." A "4" is the highest score possible. Students and facilitators BOTH must understand that the evaluation form has been designed so that a score of "4" should be given out RARELY.

This grading format can create considerable angst for students. Many got to college or graduate school because they consistently demonstrated the highest levels of academic performance. They expect their performance will continue to be given that rating. However, the top score of "4" should be reserved for the most exceptional students, typically the top 10-15% of a class. This translates to 1 or fewer students per small group receiving an overall score of 3.6–4.0 for the course.

Students may earn a “4” score in one domain, maybe even 2 without achieving an overall score of “4”.

Students are in the developmental phase of their career, and a score of “4” implies that they have little or no room for continued growth. The occasional student will demonstrate all the characteristics that “wow” us and will legitimately earn that score. However, it should not be the norm. Similarly, group process will rarely reach the level of “4”.

At the authors’ institution, a compromise was reached with students; they are graded on a 0-4 scale, but on their transcript receive a grade of “Pass/No Credit”. Thus, their score does not negatively impact overall GPA.

Sample Rubrics

Student Evaluation Form

Facilitators use this form to grade students. There are descriptors given for each possible score (1–4) on the four grading criteria. A copy of this form should be completed by the facilitator(s) for each student each time a case is completed. Each student’s scores on the various sections are collated for the entire semester, averaged, and used to determine whether the student passes, or earns no credit for the course.

The criteria for each section were developed for one particular graduate course in ethics and professionalism. Course directors are **strongly** urged to revise the criteria so this document more accurately assesses students’ progress towards the learning goals they established for their particular course.

Student Evaluation of Facilitator Form

This form lets students provide constructive feedback to their facilitators. All students should complete this form at the end of each semester. The form also can be given to students as often as desired, to obtain formative assessment and feedback.

Facilitator’s Course Evaluation Form

This form provides facilitators with a structured method for assessing the course overall. They should complete this form at the end of each semester.

SAMPLE Student Evaluation Form

Directions: circle the score that is most appropriate for the student's or group's performance during discussion of this particular case.

1. Problem Analysis, Reasoning and Moral Reflection	
4 (A)	Consistently hones in on key questions and issues presented in each case, demonstrates ability to reflect on issues from many perspectives, and develops a reasoned justification for decisions that incorporates principles, values and consequences. Frequently proposes logical and feasible approaches to resolving an issue incorporating new knowledge appropriately into reasoning
3 (B)	Recognizes key issues more often than not. Shows some ability to reflect on issues from other's perspectives and usually justifies decisions with principles, values and consequences. Proposes reasonable approaches to problem resolution and revises and re-ranks approaches in an acceptable fashion
2 (C)	Struggles to recognize key questions and issues and is slow to understand social or cultural conflicts presented. Has trouble understanding rationale for resolutions presented by others in group. Shows uneven ability to reflect on issues from other's perspectives and has difficulty in justifying decisions with principles, values and consequences. But shows progress and effort at improvement
0 (F)	Consistently fails to understand key issues or propose feasible solutions. Shows inability or unwillingness to empathize or understand other's perspectives and rarely justifies decisions with principles, values and consequences. Shows little effort to improve
Comments	
2. Self-Directed Learning, Knowledge Acquisition and Written Assignments	
4 (A)	Information is consistently correct and in-depth; Strong comprehension and application of new information; often shows in-depth preparation; frequently regarded as the group expert; Written response is on time, concise, well-organized, and easy to read
3 (B)	Usually has appropriate and accurate resources; Acquires and incorporates new concepts accurately; prepared on second group meeting; acceptable knowledge, depth, and vocabulary; Response is on time and sufficiently organized to be understandable
2 (C)	Resources are few and poor; Struggles to keep up with group knowledge level, but progress has been made during phase; Written Response submitted up to 24 hrs late; poorly organized, points are difficult to understand
0 (F)	Seldom if ever prepared; Unable to rise to group level; cannot interact with depth; cannot use new knowledge; little or no progress; Response more than 24 hrs late or never submitted; minimal effort shown; poor organization
Comments	

3. Individual Skills Within Group Process	
4 (A)	Leader in setting and maintaining agendas; very sensitive to peers, promotes involvement of other members of group; corrects other constructively
3 (B)	Conscious of time and agenda; shares information; accepted and trusted; Adequate skill in expressing knowledge and opinions
2 (C)	Significant difficulty in expressing self or shares inappropriate information not germane to conversation; Not interested in group process, but has shown improvement; low leadership qualities
0 (F)	Chronically late or absent; disruptive and/or dominating or excessively shy without trying to contribute; uninterested in cooperation
Comments	
4. Group Process Development (same grade for all students in group)	
4 (A)	Builds consensus quickly and easily; focuses on key issues and identifies appropriate learning issues; action plans and problem resolutions usually achieved with confidence; completes tasks in the time allowed
3 (B)	Usually focused and decisive; mutual respect shown; goal-conscious; responds positively to feedback; critical concepts understood; usually appropriate learning issues for research between meetings
2 (C)	Unfocused and/or halting discussion; difficulty completing tasks in time allotted, but attempting to improve performance; Struggles to agree on relevant learning issues; poor knowledge growth of members; insufficient sharing of materials
0 (F)	Usually unable to arrive at a consensus; poor focus on critical issues; lack of mutual respect; unresponsive to feedback
Comments	

Student's Name:		Date	
Facilitator:		Facilitator	

SAMPLE Form Used by Students to Evaluate Facilitators

Facilitator Name: _____

Directions: for each of the items below, circle the number that best describes how helpful and effective your facilitator was in that area. Scoring Scale: (1) never helpful, ineffective (2) tended to be unhelpful or ineffective (3) somewhat helpful and effective (4) helpful and effective (5) exceptionally helpful and effective

Group Process Facilitation

Demonstrates commitment to group by consistent attendance and engagement (e.g., keeping distractions to a minimum, remaining in room with group during the entire session, arriving on time)	1	2	3	4	5
Demonstrates adequate participation	1	2	3	4	5
Helps the group stay "on track" by asking guiding questions	1	2	3	4	5
Demonstrates equitable treatment of all students in the group	1	2	3	4	5
Suggests ways for the group to function optimally	1	2	3	4	5
Gives appropriate feedback to students in the group	1	2	3	4	5

Content Facilitation

Helps group set appropriate learning issues and tasks between first and second sessions	1	2	3	4	5
Provides instructive and perceptive examples of professional standards and ethical considerations	1	2	3	4	5
Probes group for depth of knowledge in a supportive and non-threatening manner	1	2	3	4	5

Additional Comment on strengths and weaknesses of facilitator's skills:

SAMPLE of the Facilitator Evaluation Form

Directions: for each of the items below, circle the number that best describes your opinion regarding this course. Scoring Scale (1) strongly disagree (2) disagree (3) neither disagree nor agree (4) agree (5) strongly agree.

Using the Problem Based Learning (PBL) method and discussing cases with small groups helped the students learn more than covering the topics with didactic lectures.	1	2	3	4	5
Discussing cases with the group enhanced student understanding of how to handle difficult situations and difficult decisions.	1	2	3	4	5
Hearing the viewpoints of the group members influenced the student's consideration of these topics.	1	2	3	4	5
Being in a small group helped the students learn how to work collaboratively with team members.	1	2	3	4	5
The written assignments and subsequent discussions helped the students learn where and how to find credible resources.	1	2	3	4	5
Having to discuss cases with their peers helped the students to learn how to better explain and support their position.	1	2	3	4	5
Discussing cases increased the student's knowledge of the expectations, responsibilities, and rights of a graduate student.	1	2	3	4	5
Discussing the cases increased student awareness of the roles and responsibilities and concerns of other personnel in science such as faculty members, principal investigators, postdocs, technicians.	1	2	3	4	5
Discussing the cases increased the student's knowledge of the norms and expectations for how science should be practiced.	1	2	3	4	5
The cases increased student knowledge about student and advisor relationship, laboratory personnel dynamics, research collaborations, attribution of credit for work, and plagiarism.	1	2	3	4	5
What case(s) or parts of the case(s) worked well and why?					
What case(s) or parts of the case(s) were not useful or were frustrating and why?					
What were the most useful and relevant thing(s) you learned from this course?					

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M. Ann Lambros received a B.S. degree from the University of North Carolina at Chapel Hill, a Masters degree in Higher Education Administration and a Ph.D. in Curriculum Development from the University of North Carolina at Greensboro. She joined the faculty of Wake Forest University School of Medicine in 1985 and was instrumental in the development of the problem-based curriculum for medical students implemented in 1987. She currently serves as the Assistant Dean for Medical Education and as the Director of an NIH funded center at the medical school, the Center of Excellence for Research, Teaching, and Learning, where she is involved in educational research. She has published 2 books on problem-based learning, "Implementing Problem Based Learning in K-8 Classrooms" and "Implementing Problem-Based Learning in Middle and High School Classrooms", both available through Corwin Press.

Ann M. Peiffer obtained a B.A. in Biology and Secondary Education from Cornell College in 1999, a M.S. in Biobehavioral Sciences in 2002 and a Ph.D. in Behavioral Neuroscience from the University of Connecticut in 2004. As a post-doctoral fellow at Wake Forest University School of Medicine in the department of Radiology, Dr. Peiffer uses magnetic resonance imaging (MRI) to assess structural and functional changes related to aging. Dr. Peiffer has also spear-headed the organization of facilitator and RCR training for postdocs both involved in the PBL course as well as post-docs at the institution in general. The training program was recognized by the National Postdoc Association in 2008 as ‘Most Innovative Postdoc Program’ and was provided a “Bring RCR Home” grant award in 2009. She has also served as an adjunct assistant professor at Wake Forest University in the department of Psychology

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Nancy L. Jones received her B.S. in Biochemistry at Virginia Polytechnical Institute and State University (1981) and her Ph.D. in Biochemistry at WFUSM (1987). She received a Dean’s Fellowship and a National Research Service Award for graduate training in Cell Biology and Pharmacology of Cancer and a postdoctoral National Research Service Award in Molecular and Cellular Pathology (1987-88). Dr. Jones received a M.A. in Bioethics Magna cum laude from Trinity International University (2003) and was an American Association for the Advancement of Science (AAAS)/ National Institutes of Health (NIH) science policy fellow (2005-2007). Currently, Dr.

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