

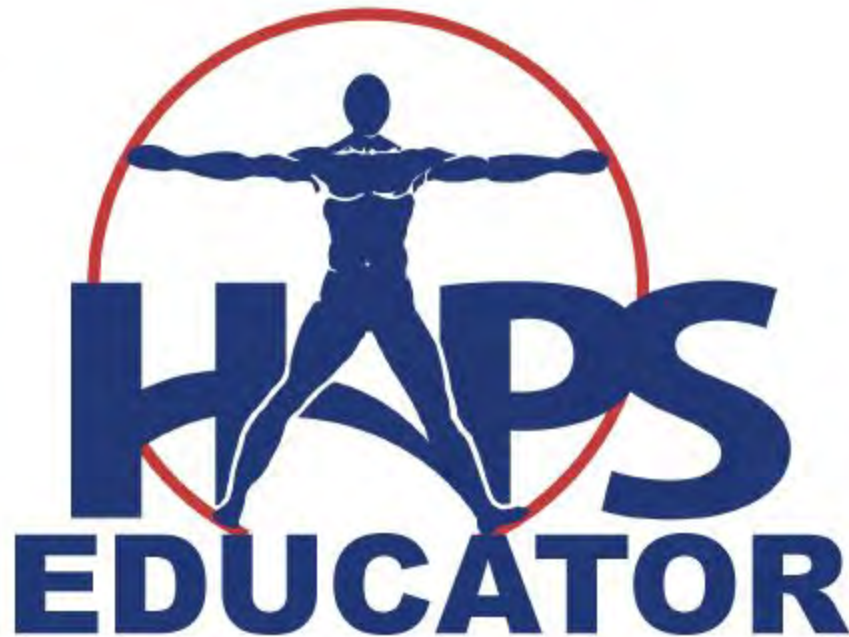
**An Introductory Framework of Problem-Based Learning (PBL)  
and Perspectives on Enhancing Facilitation Approaches**

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# An Introductory Framework of Problem-Based Learning (PBL) and Perspectives on Enhancing Facilitation Approaches

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## Abstract

Problem-based learning (PBL) is a type of active learning modality involving a student-centered approach that encompasses small group settings in order to promote learning via critical thinking and discussion as opposed to via direct presentation of facts and concepts. Through PBL, students engage actively in their learning. Facilitated PBL sessions put an emphasis on active learning by students as they explore their knowledge and understanding of medically related concepts as well as their own attitudes and values. This paper provides an introduction to the PBL modality and tips for developing a facilitation approach. Also included are examples of formative and summative feedback and implementation strategies that can be used by PBL facilitators. An example of a training exercise for PBL facilitation feedback is also presented.

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**Key words:** problem-based learning, facilitated learning, active learning, feedback

## Introduction

Promotion of active learning can involve a broad range of teaching strategies which engage students as active participants in their learning. Active learning has been shown to improve student outcomes and lead to improved critical thinking skills, increased retention and transfer of new information, increased motivation, improved interpersonal skills, and decreased course failure (Kuh et al. 2017; Prince 2004). Active learning teaching approaches range from short, simple activities, such as problem solving and paired discussions, to longer, involved activities or pedagogical frameworks like case studies, problem-based learning (PBL), flipped classrooms, and structured team-based learning (Lord et al. 2012). A student-centered approach typically involves students working together during class but may also involve individual work and/or reflection outside the classroom. The focus of this perspective article is to highlight key steps in the PBL process while providing insights into the successful development of a student-centered facilitation approach.

PBL emerged as a means to reform higher education during the late 1960s as a result of the work of Harold Barrows, a medical educator at McMaster University who studied the reasoning skills of medical students and expert practitioners (Rideout 2001; Savin-Baden 2000; Schmidt 2012; Tanner 1999). PBL became the keystone of the School of Medicine at McMaster University in 1969 (Johnson and Finucane 2000). PBL was heavily influenced by the work of John Dewey whose ideas were based in the philosophy that

learners engaged more in the learning process if the learning activity involved was meaningful and of interest to them (Schmidt 2012). It was observed that traditional approaches of teaching did not foster a favorable disposition towards lifelong learning in students, a necessity for healthcare practitioners in today's society (Alexander et al. 2002; Azer 2001; Rideout 2001; Tanner, 1999). Since that time, there has been incorporation of PBL into the curricula of medical schools throughout the world (Alexander et al. 2005; Baker 2000; Tanner 1999).

## PBL Facilitation Approaches

To familiarize educators with the framework of PBL modality and different facilitation approaches that can be practiced for an effective PBL session, the following key aspects of PBL modality and facilitation approaches are imperative:

### 1) *The PBL Modality:*

PBL starts with a problem (case) that drives the learning process and is active, collaborative, integrated, and oriented to the way adults learn (Jones 2006). A typical PBL group consists of 6-8 students predetermined by the instructor. These predetermined groups will consist of varying ranges of the following selection factors: academic performance, social skills, leadership skills, or prior conflicts.

Although PBL is a student-driven process, there is a standardized protocol that each group needs to follow to

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ensure that the case is appropriately covered. Each group will need to establish a set of ground rules and standardized roles which will be used for the duration of the time they are learning together. Modifications to these roles may need to happen in response to feedback as the group progresses through PBL sessions (Ricanati 2014). The students can have assigned roles that can be taken up by each member on a regular basis to facilitate the group process. These roles may include, but are not limited to, Driver, Scribe, Researcher, and Timekeeper (Ricanati 2014).

The case is delivered through sequential disclosure, in the span of typically 3 sessions, with small increments of the case being delivered one at a time after the previous part has been discussed. This allows students using information revealed in the case parts to apply and use it for appropriate discussions (Jones 2006). The discussions must include differential diagnoses and formulation of questions that need to be explored (also known as “what we would like to know”; Ricanati 2014). As students work at their own pace through each case, an environment of student-driven learning is created and they solve the case problems as a group. At the conclusion of the session, the group develops a set of Learning Objectives (LOs) to help them better understand the basic science and other components of the case (Ricanati 2014). These objectives are divided among each group member for individual presentations in the following session.

During the next session (session 2), each student explains their assigned objective to the group. At the conclusion of all of the presentations, additional parts of the case are disclosed, and session 1 procedures are repeated. Session 3 begins with a similar series of individual presentations followed by the remaining case parts. After discussion, the students are provided a list of Case Objectives (COs) written by the case author(s) to ensure that every PBL group has a firm understanding of the important concepts linked to the case. These should have overlap with the LOs the students prepared. Following this, the students, as a group, develop a study-guide that addresses all of the COs for that case. This guide serves as a resource for later review.

By teaching medical students basic sciences in the context of clinical settings, PBL leads to outcomes such as increased physician competency after graduation, thus highlighting the effectiveness of PBL in preparing students for subsequent clinical practice (Al-Azri et al. 2014; Koh et al. 2008). As the students work through the case together, PBL also can improve their communication and interpersonal skills, soft skills which are also beneficial to their future careers.

Key features of the medical school PBL model (presence of a facilitator and a student driven process that includes student developed objectives that are revisited and later validated by PBL session objectives) can be applied to educational activities associated with other programs of study (Duch et

al. 2001; Wilkerson and Gijsselaers 1996; Woods 1994). This also includes sessions where students are provided with an article from the primary literature and discuss and deduce inferences from the article as a group (White 1993; 2001).

It is strongly recommended to ensure that students understand the process before engaging in PBL. A “test run” activity can be performed to provide the students with experience and understanding of their roles and responsibilities. It is important to consider the logistics of implementing PBL at the undergraduate level given that many science courses involve large class sizes, providing additional infrastructure and scheduling challenges when working with such large student populations (Eberlein et al. 2008).

## 2) Developing a Facilitation Approach

Multiple factors can influence the success of the activity. These include selecting meaningful activities and/or questions, ensuring that the rationale of the activity is understood by the students, developing a thorough facilitation approach, and carrying out longitudinal recording and delivery of feedback. It is imperative to have a well-prepared facilitator for developing and implementing an effective PBL activity. The facilitation approach will be influenced by the context of the course including number of students, experience and background of the students, time availability, and infrastructure (tools, technology, furniture).

One of the most important elements of a successful PBL activity is that students feel a sense of accountability for participating in the assigned roles and responsibilities within their PBL group. This can be ensured by confirming that the ground rules for the group include being prepared for each session. Another way to ascertain accountability is by listening carefully to the group conversations and encouraging the discussions to stay on topic when necessary. Additionally, it is important to promote equitable contributions from each PBL group member. One of the most important aspects of facilitation in PBL is providing comprehensive and continual constructive feedback to the PBL group and to each individual member. In addition to providing feedback themselves, facilitators must also ensure that peer evaluations conducted within the group are consistent and specific. Table 1 was created in response to feedback from colleagues and summarizes the characteristics of an effective PBL facilitator.

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Characteristic	Implementation Examples
Be an “expert learner” not a “content expert*” or “source of answers”	Student: Dr. X (facilitator), what does this value mean in this case? Dr. X: This is a good point to research and explore. OR Does anyone from the group have any experience with this value and its relevance?
Be familiar with the case/ activity	Dr. A (physiologist) facilitating a case related to infectious diseases has read the case and gone through the facilitator’s guide thoroughly.
Foster student discussion– encourage participation	During the session, when the facilitator is asked a question, it is best to deflect it back to the students to answer. Also, when students aren’t discussing a topic, it can be helpful to ask them questions and be comfortable with silence until they answer.
Be invested in the students’ learning and growth	Be on time and prepared. Ask them questions about their presentations. Take notes on their performance in the sessions. Meet with the students to discuss their performance and work with them to address any issues. Follow up on the issues as the students progress.
Ask leading questions	What evidence can you point to that supports your statement? Does everyone understand what this means? What else could be going on with this situation?
Establish a positive, supportive learning environment	Use “we” instead of “you. Exhibit patience with students. Provide praise when appropriate, along with critical feedback for improvement.
Embrace the uncomfortable silence	Provide an opportunity for the PBL group to address any pauses in discussions and take the lead in utilizing the allotted time productively. Do not jump in with answers as a facilitator. The students need to be the leaders of their learning.
Don’t be a dominant force in the room but, rather, a collegial presence	Don’t: I want you to start scribing all the facts in the case. Do: It will be great if we had a scribe assigned amongst the group to note the important facts in the case.
Encourage analysis of data provided and promote integration of information	Does this change in lab values indicate an alternative diagnosis? Does anyone want to explain that CT scan and what it could mean?
Promote appropriate resource use	Student: I found a video explaining the pathophysiology of this disease. Facilitator: What is the source of this video and when is the date of publishing?
Promote continuity/focus of the discussion and support group cohesion	When the group discusses a topic that was the topic of another case or a student’s presentation, the facilitator may ask “have we had any cases like this before?” OR “this sounds similar to a student’s presentation from last session. How might this be related?” It also may help for the facilitator to be mindful of group interactions and to ask the students in a confidential setting if they are having interpersonal issues with one another and then to mediate any situations that may exist.
Evaluate students	<u>End of session feedback</u> : The group can be more mindful regarding time management; scribe did a wonderful job getting facts up quickly! <u>Weekly report evaluations</u> : Student A can work on putting across his points to the group in a more concise and articulate manner.

**Table 1.** Characteristics recommended for effective facilitation.

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### 3) Categories of Evaluations/ Assessments

For PBL, it is important to have ongoing feedback and evaluation with regard to accomplishment of competencies by each student. In addition, multiple forms of feedback can be used to establish that continuum. Examples of feedback include:

1. **Session Feedback:** This is verbal feedback give at the conclusion of each PBL session and can be directed toward the individual as well as provided to all members when summarizing overall group performance. Each student provides this feedback, followed by the facilitator(s). Here, students provide any specific feedback which they feel comfortable sharing with the group.
2. **Weekly Reports:** These provide an analysis of each individual student during the week. This provides an opportunity for any additional comments and allows highlighting of areas that may need special attention.

3. **Narrative self-reflection:** Students perform self-evaluation using guided questions which are discussed during one-on-one meetings with the facilitator.
4. **Facilitator(s)' student evaluation:** These questions are primarily identical to the narrative self-reflection questions, but from the facilitator's point of view. This may contain added sections such as Medical Student Performance Evaluation (MSPE).
5. **Mid and End of PBL Block Feedback:** Facilitators have one-on-one meetings with each PBL group member to discuss their progress and self-evaluation of their performance. This time may also be utilized for discussing action items (goals for improvement created by the students with support from the facilitators that are then forwarded to new group facilitators for the subsequent PBL sessions). These typically happen at the mid and end of the assigned duration of the PBL group.

The above-mentioned examples of PBL evaluations can take the form of formative assessment or summative assessment, depending on the curriculum (Table 2).

	<b>Formative Assessment</b>	<b>Summative Assessment</b>
<b>Goal</b>	Monitor student learning to make suggestions on ways to improve their learning	Evaluate student learning and compare it to the student goals from formative feedback or to a particular competency.
<b>Timing</b>	During a learning activity	At the end of the learning activity
<b>Grading</b>	Provide students with low stakes feedback with low or no points assigned	Provide students with a moderate/high point value score or result
<b>Frequency</b>	Can be provided several times during a course/activity etc.	Can be provided a few times over the course of the academic year, but only once per cohort of PBL students.
<b>Format</b>	Can cover many question formats	Can only use a limited number of question formats
<b>Application</b>	Provides a snapshot of learning/teaching during a session	Information can be used formatively: for example, students/faculty may use it to guide efforts and activities in subsequent courses
<b>Examples</b>	Session feedback, Mid-PBL block feedback, Narrative self-reflection questions	End of PBL block feedback, Medical student performance evaluation (MSPE), PBL content graded essays

**Table 2.** Comparison between formative and summative assessments.

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4) Student Perspective

Apart from facilitator to student feedback, another vital aspect to be considered in optimizing the facilitation approach is for students to provide feedback to their facilitators. This allows for constant enhancement of the facilitation approach and the identification of targeted areas for improvement.

A key aspect to promote authenticity of the feedback from students is to ensure that the feedback is submitted anonymously. This allows students to feel comfortable in sharing their feedback since it is not possible for there to be negative consequences. A few recorded examples of student perspectives on the facilitation approach (comments provided by students to their PBL facilitators, shared anonymously by those facilitators) are included below:

- *“She is the epitome of an optimal facilitator. She allows autonomy, facilitates creativity, and acts only as a guide to keep us on track, within the bounds of where we should operate within the PBL sessions.”*
- *“She is an excellent facilitator. She ensures that we are doing the vast majority of the work but does not hesitate to step in and promote a discussion. Her feedback for the group has always been helpful and specific. She is always available to lend an ear whenever necessary. I will miss having her as my facilitator.”*
- *“...If anything, the only improvement could be to step in when the conversations were really losing direction. There was one member of the group who often lacked focus in his presentations or his arguments that detracted from the*

*group’s experience, and I think it would have been nice to have him hear that from the facilitator as well.”*

- *“She gave me incredible feedback during my mid-group written narrative feedback. She helped me focus on the things I had seen needed improvement, aided me in developing a plan to improve, and encouraged me and gave me feedback as we progressed”.*
- *“She was AWESOME! Her mid-block feedback was excellent and her feedback at the end of each case was excellent. We talked about ways to get an understanding of all students learning objectives in advance of the sessions, so I was able to ask more questions and be more engaged during the sessions, which I did achieve. She obviously had an interest in students’ growth!”.*

5) A Training Exercise for PBL Facilitation Feedback

To exemplify feedback implementation, it is helpful to have faculty engage in activities to model the behavior. For example, the following activity can be implemented through PBL facilitator training to help facilitators respond to unique situations that may arise and require feedback. Divide faculty into groups of 2-3 members and have them work through a set of different scenarios as a group (Table 3; Ricanati 2014). Approximately 10 minutes should be allowed for the provision of appropriate feedback for each scenario. At the conclusion of the 10 minutes, reconvene as a large group so that the responses of each group can be shared. This activity can be implemented either as part of an initial facilitator training program or provided to facilitators as a resource for faculty development.

As a <u>Facilitator</u> , please provide feedback for following student scenarios		
	Scenario*	Notes
1	Student A: contributes little, stares at the computer or at their notes	
2	Student B: dominates conversations, intimidates other group members	
3	Student C: one step behind the discussion, on their ANKI deck, last minute/a few minutes late submissions	
4	PBL Group 1: sarcastic humor, inflexible, putting down ideas if disagreement in the group	
As an <u>Observer of the facilitation</u> , please provide feedback for following faculty scenarios		
1	Dr. G: appears sleepy, goes through emails, busy on device(s), provides generalized feedback	
2	Dr. Q: content expert who appears passionate about their discipline, quick to jump in	

\* Some of the activity scenarios were adopted and modified from (Ricanati 2014).

**Table 3.** Training exercise for PBL facilitation feedback.

## Conclusions and Future Directions

An introduction to the PBL modality provides helpful tips on how to be an effective facilitator, including pointers related to feedback delivery and PBL assessments. Future faculty development regarding the facilitation approach should incorporate additional time dedicated to hands on learning and include ample examples and problem sets. An additional avenue to explore for the future would be to incorporate common topics in the basic sciences (anatomy and physiology, microbiology, molecular biology, etc.) and to identify ways to use PBL to cover those topics.

PBL can also be incorporated outside of professional schools in various undergraduate programs. For example, a lecture on human reproduction can easily be adapted to PBL modality by development of a case involving fertilization and gestation period for a young couple and include elements of associated complications and types of delivery options available for the couple. However, as long as the core concepts of PBL modality are maintained, (small group discussions, end of session peer feedback, etc.), slight modifications, (e.g., switching from 3-day cases to 1- or 2-day cases) may be made for a more seamless incorporation into settings outside of professional schools.

In summary, the PBL modality is a vital tool for diverse topics and educational settings and can provide opportunity for student-driven active learning sessions. Developing a facilitation approach for PBL requires critical thought and adaptability by educators to ensure successful implementation.

## About the Authors

Dr. Samiksha Prasad is an Assistant Professor in Medical Education at the Dr. Kiran C. Patel College of Allopathic Medicine, Nova Southeastern University. She has been using multiple learning modalities within integrated, preclinical medical education curricula including didactic and active learning modalities. Dr. Prasad serves as the director of curriculum thread and course blocks. She has actively conducted funded research on host-pathogen interactions and medical education and published in peer-reviewed journals. She has also been involved in community engagements that focus on encouraging health and sciences. Dr. Chasity O'Malley is an Associate Professor of Medical Education and Physiology at Boonshoft School of Medicine at Wright State University. Her research goals aim to improve the learning experience for students by helping them learn to study and interact with the material in meaningful ways and for faculty by helping guide them on implementing active learning into their classrooms and is a co-principal investigator for an NSF grant related to this work. She also is actively involved in promoting diversity through her funded research projects centered around enhancing training for medical students related to the LGBTQ population.

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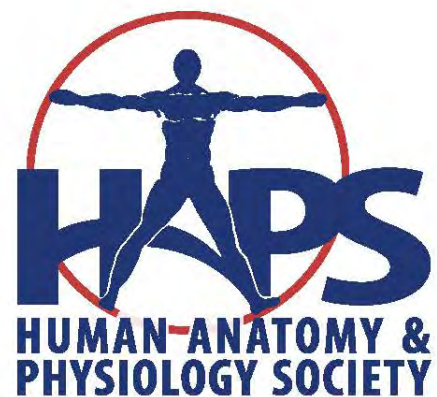
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