

# Using Problem-Based Learning to Link Classroom and Clinical Education

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## KEY POINTS

Integration of PBL into practicum courses links classroom learning with clinical practice.

PBL allows for synthesis of what students sometimes see as fragmented knowledge.

A step-by-step PBL lesson plan will add consistency between courses and instructors.

ATHLETIC training educators strive to develop instructional strategies that will help students integrate classroom knowledge into clinical practice. Problem-based learning (PBL) is an educational method based on the idea that social interactions and a team

approach to solving problems results in deeper learning than learning that occurs in isolation.<sup>1</sup> PBL fosters the self-directed learning skills that are needed to stay current in an ever-evolving clinical environment.

Learning is not based on the mere simple acquisition of knowledge, but rather

the integration of multiple concepts into practice. Unfortunately, many students often struggle to integrate knowledge learned in the classroom into clinical practice. Athletic training educators can serve as catalysts to help students apply knowledge to clinical practice. Students benefit when educators use a variety of pedagogical approaches, because multiple learning styles advance both the cognitive and psychomotor skills. As technology advances and new information becomes available, clinicians must possess the ability to apply new knowledge to practice. Advocates of PBL suggest that

the method provides a structure for gaining new knowledge in clinical contexts, develops an effective clinical reasoning process, and increases a student's motivation to learn.<sup>2</sup>

The purpose of this report is to demonstrate how athletic training educators can integrate PBL into an undergraduate or graduate athletic training education program and to provide a step-by-step plan utilization of PBL.

## What is PBL?

PBL is an educational method that identifies a problem as a context for student learning. It emphasizes critical thinking skills, deductive reasoning, and knowledge skills and behaviors. PBL is believed to encourage self-direction and development of lifelong learning and promotes the sharing of learning within a group. Students from programs that use PBL have been shown to develop strong clinical competencies.<sup>1,3,4</sup> PBL originated in medical education but is now used in multiple settings, such as K-12 education, social sciences, health professions, law, business administration, engineering, and aviation.<sup>5</sup>

## PBL in Health Professions Education

Medical and health professions education programs began using PBL to address specific concerns, such as poor long-term recall, lack

of clinical reasoning skills, and lack of self-directed learning skills.<sup>1,2</sup> An overreliance on lecture-based delivery of curricular content was identified as a cause of poor learning outcomes.<sup>6</sup> Learning basic science concepts in a problem-based format was theorized to provide a cognitive map, or schema, that helps to structure knowledge in a manner that students would better retrieve from memory when needed in clinical practice.<sup>7</sup> The PBL method is more active than traditional lecture delivery of content; it teaches students to collect data, verify the data, and draw conclusions—in short, to develop reasoning in a systematic way. Students need to learn how to learn, and not just what to learn, to be successful.<sup>7</sup> An educator needs to assess more than a student's recall and recognition; the assessment needs to include clinical reasoning and clinical performance.

The philosophy of PBL is consistent with recommended guidelines for athletic training education. The NATA Clinical Instructor Educator (CIE) Seminar handbook stresses that “emphasis should be placed on moving students from general technical skills in the early phases of clinical education into the specific therapeutic skills that require the use of sound judgment and critical thinking.”<sup>8(p.4)</sup>

Research findings suggest that PBL is a positive approach to educating athletic training students.<sup>3,9-13</sup> PBL has been reported to have a beneficial effect on students' attitudes toward learning.<sup>11</sup> Students who have acquired knowledge in the context of problem solving have been shown to be more likely to spontaneously use it to solve new problems than individuals who have acquired the same information from more traditional learning method.<sup>13</sup>

Use of PBL in athletic training education is further supported by the NATA CIE handbook, which states, “clinical proficiency requires that students be able to smoothly integrate knowledge, skill and attitudes into the ‘real-world’ setting, and that they be able to think critically and problem-solve based on the given situation. Without providing the natural progression from skill acquisition to critical thinking, students will become highly skilled technicians, yet not able to function effectively as clinicians.”<sup>8(p.8)</sup>

## Putting PBL Into Practice

Use of PBL in clinical practicum courses provides a mechanism for connection of theory to a student's clinical experiences. Students can be assigned learning problems that correspond to the content of various

courses, which facilitates learning over time, and synthesis of knowledge that students sometimes view as a fragmented process. Students often compartmentalize blocks of knowledge, which makes blending knowledge gained from different courses difficult. PBL enables the student to see the broader picture; it helps the process of learning how to learn. Table 1 presents goals associated with the use of PBL in athletic training education.

**TABLE 1. GOALS FOR USE OF PBL IN ATHLETIC TRAINING EDUCATION PROGRAMS**

- Integration of knowledge, skills, values, and clinical proficiencies
- Development of critical thinking skills and clinical reasoning
- Learning how to learn, not just what to learn
- Facilitation of experiential learning
- Development of PBL portfolios that document learning over time

## A PBL Lesson Plan

PBL requires students to investigate cases or problems that are prepared in advance by the instructor. Problems can be developed from cases published in the annual supplement of the *Journal of Athletic Training* or current cases being managed in the athletic training room. What might be viewed as a minor injury by an experienced clinician can be perplexing to a student who is exposed to such a case for the first time.

In our experience, students do not develop the necessary skill set to fully engage in the PBL process until the third clinical practicum course. Table 2 presents a step-by-step plan for implementation of PBL in athletic training clinical practicum courses. It includes an 8-day lesson plan with objectives, lesson procedures, lesson activities, and outcomes/assessments. We use this template for every PBL case presented in six clinical practicum courses.

Before each new case is presented, students are assigned to groups of 3-5 students. Although medical education research suggests that PBL is best accomplished in a group of 5-7 students,<sup>1</sup> our experience suggests that a smaller group of 3-5 students is optimal. Approximately 30 minutes of class time is devoted to working on cases each week. Students are expected to work individually outside class time to complete assignments. Each student maintains a portfolio of

his or her work. The portfolio is a course requirement that receives a grade. Students turn in homework, such as vocabulary lists, summaries, and reviews. An assignment that has proven particularly beneficial for development of students' critical thinking skills is writing "why" and "why not" statements for each of the differential diagnoses identified. The "why" is a statement that explains the reasons a student thinks the injury or illness *could be* a particular diagnosis from the list of differential diagnoses. The "why not" statement explains the reasons a student thinks the particular diagnosis *could not* be the correct one for the case.

During group discussion in the classroom, each student must explain the process by which he or she selected a diagnosis, not just discuss the characteristics of the case. This procedure helps the students to recognize that they can learn how to learn. Students discuss with the small group, and with the entire class, what

worked well and how they arrived at a final diagnosis. Students also write a reflective essay about the process of selecting a diagnosis for the case.

Students need a lot of step-by-step instruction initially, but they soon begin to demonstrate motivation to complete the process independently. PBL is student-directed rather than instructor-directed. The process of working through a PBL case should be slow and methodical. At first, it may seem like an arduous process for the student. Over time, students develop a better understanding of the process and the expectations for each case. A limit of one case per month is recommended in order to give students time to work on the case and complete writing assignments. The process improves the students' writing skills, as the instructor provides feedback at different stages in the completion of the assignment. Table 3 presents recommendations for integrating PBL into an ATEP.

**TABLE 2. CLASS BY CLASS LESSON PLAN FOR USE OF PBL IN A CLINICAL PRACTICUM COURSE\***

Day	Objectives	Lesson Procedure	Lesson Activity	Outcomes/ Assessment
1	Define unknown terminology from a history and physical exam. Analyze and evaluate history and physical exam.	Students are given history and physical exam of patient.	In groups of 3-5, students discuss history and exam. Students make a list of terms they are unfamiliar with that they will need to operationally define.	List of operational definitions
2	Discuss and critique differential diagnoses. Critically think through the injury.	Students reconvene and share information on terms. They then brainstorm on their initial differential diagnosis based on the history and exam.	Students are asked to discuss in groups all the possible diagnoses for this particular patient. They are asked to then brainstorm individually on why they think it could be that particular injury and why they think it could not be that particular injury.	Each student will individually write up a "why and why not" statement for each diagnosis. They must cite references for their rationales.
3	Develop final list of differential diagnoses. Debate "why and why not" papers.	Students reconvene and share information on their "why and why not" papers.	Each group writes their diagnoses on the board and as a class they discuss diagnoses that their group may not have had. Interject any diagnoses that they should have perhaps thought of but did not.	Amend individual papers to include new diagnoses learned from group discussion and operationally define unfamiliar diagnoses.
4	Compare various diagnostic studies.	Groups meet in class to discuss what lab test, radiographs, or other diagnostic studies would aid in the diagnosis (this is for upper level practicum PBL).	Write up operational definitions for unfamiliar tests/ studies.	Write up operational definitions for unfamiliar tests/ studies.

(continued)

**Table 2** (continued)

Day	Objectives	Lesson Procedure	Lesson Activity	Outcomes/ Assessment
5	Examine various diagnostic studies.	The instructor identifies all recommended lab studies and diagnostic workups that should have been identified.	Students are shown actual (anonymous) X-rays and/or MRIs if available. The student is not being taught to read them or make any judgment regarding them. It just lends itself to the “realness” of the scenario.	Amend individual write up on operational definitions for workups.
6	Develop final diagnosis.	Students reconvene to discuss final diagnosis, treatment, and outcomes.	They must bring to class their own write up of what they believe is the final diagnosis and why. The instructor reveals the actual final diagnosis and students discuss the diagnosis and begin discussion on treatment and outcome.	Write up of what the student believes is the final diagnosis and why.
7	Develop and explain treatment and outcome.	Students reconvene after researching treatment and outcome. Students meet to have a final discussion on the injury.	Students have individually written up treatment and outcome but discuss it with their groups on this day.	Write up treatment and outcome.
8	Evaluate problem based learning process with this case.	In the final debriefing students discuss the process of getting to the answer not the subject of the case.	They discuss what worked well and how. They usually self identify who did what amount of work and who fell short.	Write a reflective essay at the end of each case.

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### TABLE 3. RECOMMENDATIONS FOR INTEGRATION OF PBL INTO AN ATEP

- Implementing PBL into your ATEP takes time. Stay positive! Expect resistance from the students at first until they “buy into” the concept.
- Doing PBL requires a lot of writing from the student. This too will be an area of resistance initially. Writing skills should improve over time as well.
- Be consistent. Stick to the lesson plan whether it’s a novice problem or a more advanced problem and between courses and instructors.
- Be sure to use PBL case that coincides with current or previous athletic training courses. Do not use problems with material they have not yet covered in a formal course.
- Use PBL in clinical courses to allow students to relate it to “real-world” experiences that they have had or will have.
- Limit your involvement with class time discussion of the PBL case. Encourage students to “work it out” themselves.
- Make sure PBL is student directed not instructor led.
- Spend no more than 30 minutes a week in class working on the PBL problem. Require students to meet outside of class.
- Require students to keep all work on PBL cases in a portfolio.
- Provide written feedback to the students on each part of PBL assignment they turn in.
- Grade the PBL portfolio using a standard rubric that is the same one used for all PBL cases/classes and make sure it is part of each clinical course’s requirement.
- Keep portfolios on students from each semester. Their work shows learning over time through documented evidence of their developing thought processes and critical thinking.

## Summary

PBL is a valuable educational model for athletic training educators. It is not easy, but it has helped students to solidify the link between classroom learning and knowledge application to clinical practice. It promotes higher-order thinking and critical thinking skills. The process of analyzing problems and synthesizing information may prove to be highly beneficial for success in solving the types of problems presented by the Board of Certification exam. ■

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