Chapter 6

21st Century Problem-Based Learning: A Medical Education Asset by Rational Design or Retrofit

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ABSTRACT
An account of 21st century problem-based learning (PBL) in preclinical medical education is provided through a detailed explanation of the overall process, a description of PBL case construction, and a brief consideration of related activities, including case wrap-up sessions and facilitator debriefing meetings. Composition of student PBL groups, the role of the faculty facilitator, and PBL decorum are also explored in this chapter. The implementation of PBL in a new medical school curriculum by rational design is compared to the introduction of PBL into an existing medical school curriculum by retrofit. Advantages and challenges of PBL are enumerated; a brief comparison of PBL with team-based learning (TBL) is also included.

INTRODUCTION
As new medical schools continue to emerge in the United States, some will consider adopting problem-based learning (PBL) as a curriculum delivery modality in the first two years of undergraduate medical education. This decision will be in part or in toto as a rational design process. In contrast, retrofitting of PBL into existing undergraduate medical curricula is also under consideration or an on-going process.

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at some U.S. medical schools. This rise in curricular PBL integration is in response to the requirement that medical schools undertake regular, broad curriculum reviews of content and delivery methods as part of continuous quality improvements. This integration aims to meet accreditation agency mandates for the provision of self-directed learning opportunities to enhance metacognition in adult learners by implementing active learning in a small group format.

The goal of this chapter is to explore the andragogy of PBL, providing a detailed account of the process as a curricular delivery method in undergraduate medical education. This chapter is not intended to provide data on student outcomes that can be directly ascribed to a PBL curriculum. Instead, the collective experience of the authors will be used to highlight considerations specific to the implementation and utilization of PBL in either a rational design or a retrofit scenario. Chapter objectives are intended to provide the following:

- **Historical Background:** An outline of PBL in undergraduate medical education with an emphasis on its use in the 21st century
- **PBL Process Overview:** A description of the method of active, student-directed content acquisition
- **Analysis:** PBL implementation by rational design vs. retrofit
- **Outline of Perceived Advantages of PBL:** Advantages to undergraduate medical education and a delineation of challenges
- **Comparison of PBL to Team-Based Learning (TBL):** Briefly comparing two active learning modalities used in undergraduate medical education

**HISTORICAL PERSPECTIVE: PROBLEM-BASED LEARNING IN 20TH and 21ST CENTURY MEDICAL EDUCATION**

PBL emerged in the second half of the 20th century at McMaster University School of Medicine in Hamilton, Ontario, Canada as a way to revitalize undergraduate medical education (Barrows, 1994; Gallagher, 1997; Norman & Schmidt, 1992). Although the philosophy informing PBL has remained recognizable since its inception, the pre-Internet era comprised a more challenging time in which to implement this self-directed instructional format. The advent of the Internet and the ever-expanding availability of online learning resources have greatly enhanced the feasibility of self-directed student learning in PBL and other curricular contexts (Pluta, Richards, & Mutnick, 2013).

By the early 21st century, a majority of U.S. allopathic medical schools were incorporating PBL, in varying degrees, into their preclinical curricula (Kinkade, 2005). As the second decade of the 21st century ends, new U.S. medical schools are creating preclinical PBL curricula by rational design (e.g., Carle Illinois College of Medicine). Other institutions are revising their educational strategies to incorporate PBL (e.g., California Northstate University College of Medicine).

**PBL OVERVIEW**

At its inception, PBL in undergraduate medical education had a well-defined structure (Barrows, 1986; Taylor & Miflin, 2008). Many early practitioners attempted to retain it in its “pure” form (Nendaz & Tekian, 1999). The original intent of PBL was to provide a richer, expanded motivation for learning by
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