Implementation of a Problem-Based Approach in an Undergraduate Cognitive Neuroscience Course

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In this article we describe a modified implementation of an instructional strategy known as problem-based learning (PBL) in an introductory cognitive neuroscience course (Brain and Cognition). Our goal in this paper is to describe the principles of PBL that we found effective and then demonstrate how these principles fostered our continued restructuring of this undergraduate course. We share the details of our evolution over a three-year period because we found that the implementation of PBL is not an easy transition. However, we found it a very positive experience for us and our students, and the course is now very well received. Although we have implemented these principles for a cognitive neuroscience course, any course in which the content can be introduced through large problems could take advantage of this approach.

Prior to the first year of our course restructuring, the instructional method for Brain and Cognition was largely lecture and demonstration. We were concerned that students didn’t participate actively in class discussions and that they appeared to transcribe the lecture without much synthesis or analysis. The rote memorization strategy adopted by our students typically does not support long-term retention (Ausubel 1963; Siegl and Shaughnessy 1994). In addition, this transcription/ Memorization approach does not work well in a domain like cognitive neuroscience where there are few hard facts about how the brain works to support higher mental functions like memory, language, or intelligence. We also wanted the undergraduates to become more engaged in the learning experience and begin to use the tools of neuroscience to solve problems in their own domains. In an attempt to increase student interaction, decrease lecture time, and provide students meaningful learning activities, we began to change the instructional format to include the use of authentic problems in a PBL format. We use our case to describe principles of PBL that we found most critical to consider when meeting the instructional goals for the course.

Goals and Principles of PBL

Problem-based learning is an instructional strategy that places students in problem solving situations (Albanese and Mitchell 1993; Barrows and Myers 1993; Hmelo 1998; Savery and Duffy 1996). Originally implemented as an alternate curriculum in medical schools, the use of PBL has been extended to an increasing number of areas including business, education, architecture, law, engineering, social work, and high school (Savery and Duffy 1996). This method uses less lecture-based learning while placing more emphasis on independent learning and problem solving. Goals of this strategy include allowing learners to develop an integrated knowledge base that is better retained in memory for later use in real-world situations and to develop skills for effective collaboration with peers (Barrows and Myers 1993).

In contrast to other methods, a problem is presented prior to the concepts needed to solve the problem. The problem provides the context from which the need to understand the concepts and issues emerges. In this process, students