PBL is an instructional method that challenges students to “learn how to learn” by collaboratively solving open-ended problems, with many being real-world problems. It is based on the constructivist model of learning and consists of 1) ill-structured problems that are likely to generate multiple hypotheses about their cause and multiple approaches to their solution, 2) student-centered learning, where students determine what it is they need to learn and find appropriate resources for information, 3) teachers acting as facilitators or tutors, and 4) authentic, real-world problems [5]. With PBL, in addition to traditional course content delivery methods, students are engaging in a systematic and iterative process that begins with problem analysis, carefully and methodically dissecting a problem by reflecting on prior knowledge to identify knowledge gaps, situational constraints, and other pertinent problem features required to formulate a solution. This is directly related to the Engineering Design Process and students can see the Process applied in a meaningful way.

Research has shown that PBL improves student understanding and retention of ideas, critical thinking and problem-solving skills, motivation and learning engagement, and the ability to adapt their learning to new situations [6]. In the Journal of Engineering Education in 2011, Litzinger states that “it is clear that [engineering] students would benefit from a greater number of opportunities to address authentic problems” and recommend PBL as an instructional approach that can be used to achieve this goal [7]. There is forty years of accumulated evidence that the instructional strategies and procedures that make up standards-focused PBL effective in building deep content understanding, raising academic achievement and encouraging student motivation to learn. Research studies have demonstrated that PBL can be more effective than traditional instruction for long-term retention, skill development and satisfaction of students and teachers [8] and improve students’ mastery of 21st-century skills [9]. As shown by Sridhara at Middle Tennessee State University [10], by incorporating PBL into their flagship Engineering Course, both retention and academic performance improved. This was based on not only informal feedback from students but was also reflected in an improvement in their grades.

Research Plan/Method

PEAK Performance plans to incorporate four PBL experiences in the Introduction to Engineering course for both the Fall and Spring semesters on the Dunwoody and Clarkston campuses. These projects will range from small scale projects that can be completed in a day to full scale projects which require weeks to complete. Learning objectives for the projects will be developed so that they align with the Common Course Outline Learning objectives for the course. The Research Plan is comprised of 4 parts: 1. Students are given pre-project surveys and are introduced to the PBL Method and
its objectives 2. Students are assigned the project and given Project Rubric 3. Students execute project objectives and produce project deliverables, and 4. Students and Faculty have a post project review and reflection as well as complete post-project surveys. The proposed projects are Save the People I (Straw Towers), Save the People II (Egg Drop), Rube Goldberg Construction, and Improving Your Surroundings through Engineering. The last two projects will involve tremendous collaboration and creativity. Dr. Valerie Bennett, who has had some experience using PBL in her courses both at GPC and at her previous institutions, will incorporate all projects for the Fall and Spring. She will also make use of online resources. There are several instruments that will be utilized to achieve the proposed objectives. They include Surveys, Project Rubrics, Project Reports, Reflections, Discussion Threads on iCollege, ePortfolios, video, and a student developed website through iCollege that will document the PBL process and outcomes.

**Evaluation Plan**

The author will evaluate a) the student’s attitude towards Engineering at the beginning and at the end of the course, b) the extent to which students have learned a sense of collaboration, communication, and critical thinking (post-project), and c) the course’s retention rate. For parts a) and b), students will complete several surveys, an Engineering attitude survey that will help to gain insight as to the students’ motivation for taking the course, previous exposure to Engineering as well as their expectations for the course. The other surveys will be given after each project to obtain important feedback from students. The retention rates will be calculated for each section of Introduction of Engineering taught by the three professors listed above as well as the control classes where PBL is not incorporated into the curriculum. Baseline data of retention rates for this course for at least one previous academic year will also be obtained. A research student will assist in gathering data, understanding trends and formulating conclusions about the data, as well as assist with formulating surveys.

**Dissemination**

The results of this research will be shared with our colleagues through the appropriate college venues. These include Conferences at Georgia Perimeter College such as the GPC Teaching and Technology Conference as well as Department sponsored Lecture Series. Abstracts will also be submitted to be considered for publication in the appropriate Journals. The proposed Conference where research will be presented is organized by the American Society for Engineering Education. Other appropriate Conferences will also be identified.

**REFERENCES**

4. Tabulated by National Science Foundation/Division of Science Resources Statistics (NSF/SRS); data from Department of Education/National Center for Education Statistics: Integrated Postsecondary Education Data System Completions Survey and NSF/SRS: Survey of Earned Doctorates.