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***Assessing the Instructional Effectiveness of Problem-based Management Education in
Thailand: A Longitudinal Evaluationⁱ***

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Abstract

Problem-based learning (PBL) has attracted increased interest in higher education over the past 20 years due to claims that it provides a more active and productive environment for learning. Yet, to date, most empirical research on the effectiveness of PBL has been conducted in medical education. This paper examines the instructional effectiveness of a problem-based curriculum in a Master of Management program at a business school in Thailand. The study draws on seven years of student evaluation data to compare the instructional effectiveness of courses offered in a PBL track with other courses taught in the college. The results suggest that students perceived PBL as an effective approach to learning. PBL courses fostered a more active, engaging classroom environment that helped graduate management students understand how to apply theory to practice. The findings offer initial empirical support for the use of PBL in management education and counter the belief that Asian students are not responsive to learner-centered approaches to education.

Business schools have struggled with issues of curriculum relevance and effectiveness since their inception more than 100 years ago. As long ago as 1940, Charles Gragg, a professor at the Harvard Business School, stated: “Education in the professions should prepare students for action.” Gragg and his colleagues subsequently developed case teaching as a vehicle designed for achieving this goal (Barnes, Christensen, & Hansen, 1994; Christensen, 1987, 1991; Garvin, 2003; Gragg, 1940; Romm & Mahler, 1991). Yet, despite the widespread use of case teaching, critics continue to allege a lack of efficacy in bridging theory and practice in management education programs (Bennis, & O’Toole, 2005; Bridges, 1977; Heskett, 2005; Milter & Stinson, 1995; Mintzberg, 2002; Pfeffer & Wong, 2004; Romme & Putzel, 2003). Thus, business schools have joined a broader search by professional schools for curricular and instructional methods that enhance student capacities to acquire, retain, and apply knowledge gained in higher education programs (e.g., Bok, 1989; Bridges, 1977; Gijsselaers, Templaar, Keizer, Bernard, & Kasper, 1995; Kember, 2000; Major & Palmer, 2001; Murphy, 2006; Savin-Baden & Wilkie, 2004).

Problem-based learning is one approach proposed as a potentially effective alternative for education in the professions (Barrows & Tamblyn, 1980; Bok, 1989; Bridges & Hallinger, 1995; Edgerton, 2001; Major & Palmer, 2001). Problem-based learning is a constructivist learning method initially pioneered by medical educators who came to view knowledge retention and transfer as unmet priorities of the highest order (Barrows & Tamblyn, 1980; Bok, 1989; Engel, 1991). Subsequently, problem-based learning migrated from medical education into professional schools specializing in architecture, nursing, education, law, engineering, pharmacy, and management (Bridges & Hallinger, 1995; Gijsselaers et al., 1995; Major & Palmer, 2001; Smith, Sheppard, Johnson & Johnson, 2005).

The change to problem-based learning, however, represents a significant departure from the norm in universities and is seldom accomplished painlessly (Boud & Feletti, 1991;

Bridges & Hallinger, 1995; Major & Palmer, 2001; Margetson, 1991). In Asia, the use of PBL presents an even greater challenge given cultural norms that strongly reify knowledge and reinforce hierarchical relationships between teachers and learners (Hallinger & Bridges, 2007; Walker, Bridges, & Chan, 1996). For example, in one well publicized incident in Thailand a student referred to PBL as ‘buffalo learning.’ This metaphorical aspersion was meant to suggest that PBL engages groups of learners in sharing their collective ignorance (Hallinger & Bridges, 2007). Shaw has provided similarly relevant commentary in his analysis of higher education in Asia.

Blaming Asian schools for focusing on memorization -- as opposed to “thinking” – is too pat an excuse, as schools reflect the basic values of a society. It is ingrained in the Asian psyche that “correct” answers always exist and are to be found in books or from authorities. Teachers dispense truth, parents are always right and political leaders know better. (Shaw, 1999, p. 23)

While these observations reflect a skepticism shared by many Asian teachers and learners about the efficacy of learner-centered, constructivist methods, the debate also features another side. Other authors have suggested that Asian students can adapt successfully to active learning approaches such as collaborative and problem-based learning (Biggs, 1994, 1996; Hallinger & Bridges, 2007; Kember, 2000; Walker et al., 1996; Watkins, 2000, 2001; Tweed & Lehman, 2002; Vansteenkiste, Zhou, Lens, & Soenens, 2005). For example, Kember has concluded that:

There is also ample evidence that Asian students are not inherently resistant to innovative teaching strategies and are perfectly capable of participating actively in their own learning. Perceptions that they resist forms of teaching, other than traditional didactic ones, probably arose because the students were not given time and support to adapt from teaching styles they had experience a great deal towards others which they were fresh to. (Kember, 2000, p. 117)

The current study addresses this important problem through analysis of empirical data on the use of problem-based learning in higher education in Southeast Asia. This paper presents a longitudinal, non-experimental evaluation of the instructional effectiveness of a PBL curriculum implemented over a seven-year period at a graduate school of business in Thailand. The report describes the context in which PBL was implemented, discusses the design of the PBL curriculum, and analyzes student perceptions of its instructional effectiveness.ⁱⁱ The analyses focus on five dimensions of instructional effectiveness: Course Effectiveness, Instructor Effectiveness, Action-Directed Learning, Student Engagement, Assessment and Feedback.

This research makes two main contributions to the literature. First, it has been noted that most empirical studies of problem-based learning in higher education have been conducted in medical schools (Major & Palmer, 2001; Savin-Baden & Wilkie, 2004). The current study extends this empirical literature into management education. While the literature contains numerous descriptive reports on the rationale, design and implementation of problem-based management education (e.g., Bridges & Hallinger, 1995; Brownell & Jameson, 2004; Hallinger & Bridges, 2007; Kloppenborg & Baucus, 2003; Merchant, 1996; Stinson & Milter 1996; Sherwood, 2004; Walker, Bridges, & Chan, 1996; Yost & Keifer, 1998), our own search located only a single empirical study (Copland, 2000). More empirical studies are needed to complement the copious prescriptive literature on active pedagogies in management education.

The findings also extend the literature on the use of PBL in higher education by examining its application in an Asian context (Biggs, 1994, 1996; Kember, 2000; Vansteenkiste et al., 2005; Walker, Bridges & Chan, 1996). Over the past decade, growth in tertiary education in Asia has outpaced all other parts of the world (Altbach, 2004; Cheng, 2010). Understanding if and how constructivist methods such as PBL achieve their goals in

an Asian context represents a priority for higher education in the region (Altbach & Umakoshi, 2004; Biggs, 1994, 1996; Kember, 2000; Vansteenkiste et al., 2005).

What is Problem-based Learning?

Pioneers in the use of PBL in medical education sought to develop an approach to learning and teaching capable of addressing learning goals considered essential for success in the 21st century workplace. These include:

- Adapting to and participating in change,
- Dealing with complex problems and making reasoned decisions in unfamiliar situations,
- Adopting a more universal or holistic outlook,
- Practicing empathy and appreciating others' points of view,
- Collaborating productively in groups or teams,
- Developing skills and attitudes that would support lifelong learning,
- Identifying one's own strengths and weaknesses and undertaking appropriate remediation. (Engel, 1991, pp. 45-46)

Barrows and Tamblyn (1980) observed that all species of PBL share one fundamental characteristic. "In problem-based learning, the learning results from the process of working towards the understanding or resolution of a problem. The problem is encountered first in the learning process, rather than facts, models, conceptual frameworks, or other information. The problem serves as a stimulus and focus for problem-solving and learning."

Distinguishing PBL and Case Teaching

This definition of PBL suggests the first characteristic that distinguishes PBL from the case method of teaching. In the modal approach to case teaching a focal problem is presented to students *after* they have been introduced to a theoretical framework (e.g.,

motivational theory) or working process (e.g., project management). Students are then typically asked to apply the framework to the problem and make recommendations for its solution (see Barnes et al., 1994; Christensen, 1987, 1991; Christensen, Garvin & Sweet, 1991; Garvin, 2003; Romm & Mahler, 1991). Thus, although both PBL and case teaching are organized around a focal problem, the role of the problem in the learning process is quite different (Bransford, 1993; Bridges & Hallinger, 1995, 1999; Williams, 1992).

Other features also distinguish PBL from case teaching. One version of PBL adapted for management education employs a ‘project’ as the unit of instruction rather than a ‘case’ (Hallinger & Bridges, 2007). This conveys the idea that the PBL learning unit is carried out in a time-constrained environment with goals, tasks, resources, constraints and deliverables. Students are explicitly encouraged to adopt a ‘project management mentality’ towards solving the problem. This may even extend to the use of project management tools by the learners (Hallinger & Bridges, 2007).

A PBL unit is also organized differently than a typical university course. Learning objectives and relevant knowledge are derived from an analysis of the knowledge and skills needed to address important problems encountered in the field, rather than from the structure of disciplinary domains (Barrows & Tamblyn, 1980; Boud & Feletti, 1991; Bridges & Hallinger, 1995; Schmidt, 1993). Disciplinary knowledge serves application in the field rather than representing a goal of learning in and of itself.

Case teaching is generally conducted in a classroom environment where the instructor leads a large group discussion of the problem. This may or may not be supplemented by small group meetings. In contrast, PBL makes explicit use of cooperative group learning as a core learning process (Bridges & Hallinger, 1995; Hallinger & Bridges, 2007; Kember, 2000; Kimber, 1996; Norman, 1988; Smith et al., 2005). If the essence of managerial work is

accomplishing results through people (Bridges, 1977), then we assert that management education should emphasize team leadership and collaborative problem-solving skills as key learning objectives (Bennis & O'Toole, 2005; Hallinger & Bridges, 2007; Milter & Stinson, 1995; Yost & Kiefer, 1998). PBL projects are conducted in a team learning environment that pays explicit attention to the development, application, and assessment of relevant team leadership skills.

In case teaching students generally develop an analytical paper that presents a diagnosis and proposes a solution to the focal problem. PBL projects include products that express or demonstrate the team's solution to the focal problem in a more active fashion. This explicitly cues learners to the fact that their learning and assessment will be linked to implementation as well as analysis of the problem (Hallinger & Bridges, 2007). For example, in a unit on employee selection, learners not only analyze an organizational problem but also design and implement a selection process with simulated job applicants (Hallinger & Bridges, 2007). PBL projects seek, to the greatest extent possible, for learners to confront the practical realities of implementing their proposed solutions (see Hallinger & Bridges, 2007).

Finally, PBL emphasizes formative assessment that is explicitly designed to foster further learning among individuals and teams. Central to the design of a PBL unit is assessment of a simulated performance (Hallinger & Bridges, 2007). Assessment tasks and instructor feedback focus on application of knowledge as well as skills and attitudes of learners.

Instructional Effectiveness of Problem-based Learning

Perhaps the central question for teachers with respect to any innovation in teaching concerns its efficacy when compared to commonly used methods. Early studies of PBL came almost exclusively from medical education and presented a mixed picture regarding learning

and outcomes (e.g., Bridges & Hallinger, 1993; Walton & Mathews, 1989). During the ensuing 15 years, however, the scope and quality of empirical research on PBL has improved (Major & Palmer, 2001; Savin-Baden & Wilkie, 2004). For example, a recent meta-analysis found that the effects of PBL differ according to the levels of the knowledge structure being measured (Gijbels, Dochy, Van den Bossche, & Segers, 2005). More specifically, the meta-analysis reported:

- Students in PBL programs performed at least as well as students in conventional programs when assessed on their understanding of concepts.
- PBL had more positive effects than conventional methods in developing an understanding of principles.
- At the third level of application of knowledge, PBL had positive effects, but the results were not statistically significant.

While these findings on the learning outcomes of PBL are still incomplete, they do begin to provide an empirical basis for contentions made by proponents of PBL (Major & Palmer, 2001; Savin-Baden & Wilkie, 2004). In addition, there is growing empirical support for the assertion that PBL produces a more engaging and motivational learning environment for students (Evenson & Hmelo, 2000; Major & Palmer, 2001; Norman & Schmidt, 2000). This finding is relevant to the current study which evaluates the instructional effectiveness of courses delivered within the PBL track of a graduate management curriculum.

The study's conceptualization of instructional effectiveness proposes that instruction should aim at motivating students to engage productively in learning how to apply knowledge (Bransford, 1993; Evenson & Hmelo, 2000; Kember, 2000; Watkins, 2000, 2001; Williams, 1992). The rationale for this approach is stated by Edgerton (2001) who claimed that "Learning 'about' things does not enable students to acquire the abilities and

understanding they will need for the twenty-first century. We need new pedagogies of engagement that will turn out the kinds of resourceful, engaged workers and citizens that America now requires.”

Smith and colleagues (2005) elaborated on this concept of ‘pedagogies of engagement’ and asserted that instructional effectiveness can be assessed in light of the capacity of the instructional method to productively engage students in learning to apply content individually and collectively. This perspective towards instructional effectiveness informed the use of PBL in the management program that we describe in the next section of the paper as well as the selection of constructs employed in the current study.

Implementing PBL in a Management Curriculum in Thailand

The Graduate School of Business (GSB) was started in 1997 as its university’s graduate school of business. The GSB initially offered the Master of Management degree in a variety of specializations. The program was taught in English in its ‘international’ program to a typical intake of 375 students per year. Ninety percent of the students were working and took 19 months to complete the program. Although the GSB was part of a large, science-oriented, government university, it operated as a semi-independent organizational unit. Largely freed from the bureaucratic constraints that characterized the larger university, this also meant that GSB relied on student tuition fees for 100% of its funding.

GSB Vision, Mission and Organization

The GSB’s vision, from its inception in 1998, was to offer a personalized, student-centered learning experience in small classes. GSB’s stated mission was to ‘develop knowledgeable students who are able to apply knowledge effectively in their work and in their lives.’ The educational practices implied by this mission were reflected in the physical facilities of the college. Classrooms were designed to foster student-to-student interaction.

Maximum class size was set at 30 students. All classrooms were equipped with movable tables and chairs, state-of-the-art multi-media projectors, teacher workstations connected to the internet, and stereo sound systems. The combination of vision, mission, small class size, and purpose-built classrooms was designed to create a state-of-the-art, learner-centered environment that differentiated GSB from other business schools in Thailand.

Despite this seemingly receptive context for innovation in teaching and learning, a quality audit conducted in the third year of the GSB's operation (i.e., 2000) revealed a contrasting portrait.

- Most instructors kept the tables and chairs in a traditional classroom seating arrangement.
- The vast majority of class time was devoted to teacher-directed instruction broken up by occasional case discussions.
- Multi-media equipment was used only for the most basic function, electronic delivery of text-book associated power point slides; no instructors used the equipment for the delivery of multi-media cases or content.
- Although there was a clear curriculum structure on paper, delivery depended entirely on the inclinations of individual instructors, most of who were employed on a part-time basis.
- Assignments focused almost exclusively on knowledge acquisition and analysis. There was little or no feedback offered beyond grades.
- Students were required to complete either a Thesis or an Independent Study (IS) project during the capstone period in the curriculum. However, the curriculum contained no courses providing preparation for research and faculty support for student projects was sporadic and of uneven quality.

In 2000, when GSB's managers deliberated on the findings of this audit, they drew several conclusions.

- Curriculum and instructional practices were not consistent with the GSB vision and mission.
- The College was not organizing to take advantage of its strengths.
- Located in a highly competitive market, survival would depend on GSB's ability to differentiate itself from other business schools in terms of the quality of teaching and learning.
- The situation was urgent. Absent a clear strategy for immediate execution, GSB's Board of Trustees was poised to intervene by changing the management team and instituting a more tightly regulated regime of policies.

With this in mind, GSB's managers and faculty deliberated on the question of where to begin. Given the College's vision and mission, they explored a variety of instructional and curricular strategies that were explicitly aligned to the goal of learner-centered management education. Two faculty members reported positive experiences implementing problem-based learning elsewhere. Other key faculty members, several with backgrounds as management consultants and trainers, became intrigued by what they heard about PBL. Subsequently, the team decided to explore ways of incorporating PBL into GSB's management curriculum.

Design of a PBL Curriculum

After considerable debate, the management team decided to implement a PBL-oriented *Consulting Practice Track* as an additional capstone option (i.e., as an alternative to Thesis and IS). Faculty members were recruited for design teams based upon expressed interest. At an introductory workshop the instructor outlined key features of PBL and shared a framework for designing PBL projects (Hallinger & Bridges, 2007). Initial implementation

began three months later in the June term when the first PBL module was offered to about 180 students.

Over the next several years the faculty designed and implemented eight PBL projects that came to comprise the *Consulting Practice Track*. The focal problems for the projects covered high impact problems faced in the East Asian business environment:

1. *Leading Organizational Change*: A simulation-centered module on implementing change in a Thai company;
2. *Retail to e-tail*: Changing the business model from retail to e-commerce in a traditional Thai SME;
3. *Strategies for Success*: Developing successful business strategies in a highly competitive business environment;
4. *Data to Intelligence*: Managing and analyzing information in order to identify problems and make intelligent decisions;
5. *Reorganizing for Competitiveness*: Using strategic human resource management to strengthen the competitiveness of a traditional Asian SME;
6. *Employee Selection*: Designing and implementing a staff selection strategy aimed at solving a personnel problem at a local company;
7. *Projects and People*: Using skills in understanding people and project management.
8. *New Product Positioning*: Analyzing a market and presenting a plan on how to position a newly launched brand in a competitive market. (see Hallinger & Bridges, 2007 for in-depth description of the curriculum and modules)

Students selected four of the eight modules to fulfill the capstone requirement in the *Consulting Practice Track*. Each module held class meetings three hours per week for six weeks (i.e., half of the 13 week term). Given the large number of students that subsequently chose the *Consulting Practice Track* as their capstone option, typically over 300 per year, each PBL module was taught by several instructors. Although each instructor typically taught his/her own class section, it was an explicit requirement that all instructors of a module use

the same learning objectives, content, learning sequence and assessments. This was non-negotiable and raised the level of interdependence among instructors.

Assessment turned out to be one of the most significant implementation challenges. The *Consulting Practice* option was equivalent to a 6-credit Independent Study project. Grading in the *Consulting Practice Track* was, therefore, designed to mirror the grading structure used for IS and Thesis (i.e., High Pass, Pass, Revise, Fail). Students would have to pass four PBL modules in order to gain a Pass in the *Consulting Practice* capstone option. The fact that students were studying in teams further implied the need for methods of reliably assessing individual as well as team performance. Moreover, since the PBL projects resulted in the delivery of *products*, faculty needed training in performance-based assessment. These requirements led to a system of assessment that, in the end, far exceeded the assessments employed for IS and Thesis options in terms of scope, comprehensiveness and quality (see Hallinger & Bridges, 2007 for an in-depth description of assessment philosophy and methods).

We should also elaborate that the implementation of PBL at GSB was adapted to the Thai context in several ways. First, the PBL units were developed around problems in local Thai organizations as well as multi-national companies operating in Thailand. This established the relevance of the problems for students in the program and enabled GSB to develop a strong ‘global-local’ theme in its curriculum.

Second, given the lack of prior experience of students in using student-directed approaches to learning, GSB adopted a relatively structured version of PBL termed problem-stimulated learning (Barrows & Tamblyn, 1980; Bridges & Hallinger, 1995). This variant of PBL offers more direction in the learning process than some other versions of PBL (see Hallinger & Bridges, 2007). This it appeared well suited to our perception of student needs

for somewhat more organized and structured delivery (Biggs, 1996; Vansteenkiste et al., 2005; Watkins, 2000, 2001).

Third, students were actually introduced to PBL earlier in the Master degree program. After several years of implementation experience (i.e., around 2004) the faculty gradually adopted a ‘spiral curriculum’ approach that sought to foster a progressive development of the skills needed to learn effectively in a PBL environment. Subsequently, students were better prepared to gain the benefits of PBL when they studied in the *Consulting Practice Track* during their fourth and fifth trimesters. We suggest that these features of GSB’s implementation of PBL supported the capacity of Asian students to adapt and thrive in a learner-centered environment.

Research Focus and Methodology

This study sought to evaluate the instructional effectiveness of the PBL modules that comprised the *Consulting Practice Track* in the capstone portion of the M.M. program. The research questions included the following.

1. Do graduate management students perceive the courses in the PBL track in the curriculum as a more effective vehicle for learning?
2. Is PBL perceived as a more effective vehicle for instructor effectiveness?
3. Do courses in the PBL track create a more action-directed learning environment than other courses in the college?
4. Do courses in the PBL track engage students more actively in their learning than other courses in the college?
5. Do courses in the PBL track use methods of assessment and feedback in ways that contribute to student learning more than other courses in the college?

Research Design

This research employed a post-hoc, longitudinal, non-experimental design. We examine seven years of data on the instructional effectiveness of the PBL modules that comprised the *Consulting Practice Track* in the GSB Master degree curriculum. We examined instructional effectiveness in terms of five dimensions: Overall Course Effectiveness, Instructor Effectiveness, Action-Directed Learning, Student Engagement, Assessment and Feedback. Ratings of the PBL modules on these dimensions were analyzed in absolute terms as well as in relation to ratings of other courses in the GSB curriculum. Analyses examined change in student perceptions of effectiveness over time as well as comparison of the curriculum approaches. We note that a key strength of this study's design lies in the longitudinal perspective gained through the analysis of data collected term-by-term for a seven year period (Davies, 1994; Huber & Van de Ven, 1995; Singer & Willet, 2003).

Sample

The unit of analysis in this study is comprised of the course and its various class sections (i.e., a course could be offered in multiple sections within a term). We were interested in student responses on relevant course evaluation items for each class section of courses taught between June 2001 and September 2007. Since the College operates in a trimester system, the period of analysis included 20 trimesters.

Table 1 includes the sample characteristics broken down for two groups of courses: PBL Courses and Other Courses. During the period of the study, PBL Courses were taught 431 times by 49 different instructors. Ratings from the 10,031 students in these class sections were compared with ratings obtained from 36,168 students in 1,464 class sections of Other Courses. We note that the student pool in the two groups of courses would not have differed in terms of personal characteristics since by the second year of implementation over 90% of students in the college were electing the PBL track. The data in Table 1 indicate that the

student response rate was greater than 80%. These meeting the requirements for this type of research (Lyon & Hendry, 2002).

Insert Table 1 about here

Instrument

This research employed GSB's Course Evaluation Questionnaire administered to students at the conclusion of each term. Course evaluation questionnaires are subject to a variety of potential problems when employed as tools for academic research (Aleamoni, 1999; Scriven, 1988). Points of criticism include mixed purpose questions, item wording that biases student responses, overly long forms, ambiguous and compound questions, comparative questions, inconsistent or biased procedures for administration and processing of forms, and methods of analysis that provide a distorted picture of results (Lyon & Hendry, 2002; Scriven, 1988). Nonetheless, a substantial body of research clearly supports the potential of purposively designed course evaluation questionnaires for providing reliable and valid data (Aleamoni, 1999).

Both the questionnaire design and procedures for administering and using the GSB evaluation form sought to address features that typically threaten the validity of such scales (Scriven, 1988). The scale was designed after a thorough review of scales used internationally by other universities and in consultation with psychometricians. The questionnaire was administered systematically by GSB academic support staff who received several rounds of training for the task. During administration of the questionnaire, the instructor was required to physically leave the room and completed forms were collected by members of the academic staff, not the instructor. Completed forms were sent to an external company for data entry prior to analysis by college staff. These procedures were designed with the goal of increasing the validity of student ratings (Aleamoni, 1999; Scriven, 1988).

A common pool of 11 items was drawn from the evaluation form, which consisted of a total of 17 items and two open-ended questions. The questionnaire used a five-point Likert-scale in which a higher score represents a greater extent or higher effectiveness. For the purposes of this study, 11 items were selected and categorized into five dimensions: 1) overall rating of the Course Effectiveness, 2) Instructor Effectiveness, 3) Action-Directed Learning, 4) Student Engagement, and 5) Assessment and Feedback.

The overall rating of Course Effectiveness consisted of a single item that directly asked students how they would rate the effectiveness of the course. Instructor Effectiveness was defined as the professional knowledge and capacity to communicate, organize and present information effectively to students individually and collectively. This dimension was assessed through four items that asked students to rate instructors' knowledge in the subject, preparation for class, clarity of responses to students' questions, and overall rating of the instructor. The alpha coefficient for this scale was .95.

Action-Directed Learning was defined as the extent to which a course was able to bridge theoretical knowledge and practical application in the business context. This was measured by two items that asked students how well the course helped them understand the subject and make theoretical content practical. The alpha coefficient for this scale was .95.

Student Engagement represents the intensity and emotional quality of students' involvement in participating in the module's learning activities (Edgerton, 2001; Skinner & Belmont, 1993; Smith et al., 2005). This was measured by two items that asked students to rate the extent to which the course allowed them to become actively involved in their learning and encouraged students to learn from each other. The alpha coefficient for this scale was also .95.

Assessment and Feedback was defined as the quality of assessment of students' learning and provision of useful feedback that contributes to learning. This was assessed

through two items that asked students to rate the class on the appropriateness of assignments and quality of instructor feedback. The alpha coefficient for this scale was .90.

Data Analysis

Data analysis focused on two main issues with respect to the four research questions. First we sought to understand whether students reported that the PBL Courses consistently met the criterion at a high standard. This was accomplished first through analysis of descriptive statistics. Then, we sought to test whether students perceived PBL courses as more effective than courses using other instructional approaches. This was conducted with Independent Samples *t*-tests.

Subsequent analyses sought to exploit the longitudinal features of the data set by incorporating various approaches to growth modeling (Davies, 1994). We began this phase of the analysis by graphing the trends in course results for the PBL and Other Courses term-by-term over the seven year period. Then we constructed Mix Models (Heck, Thomas, & Tabata, 2010) to assess differences in student perceptions of the PBL Courses with all Other Courses on the five dimensions over time. This test is able to take into account variability in individual instructors as well as variance in the change trend year-by-year over time. Thus, although this evaluation of the instructional effectiveness of PBL employed a non-experimental design, access to a large longitudinal data set made it possible to apply powerful tools for growth modeling and to reveal robust trends over a substantial period of time.

Results

We began by presenting descriptive statistics that describe student perceptions of PBL and Other Courses over the seven-year period of the study (see Table 2). In 2001 the mean Course Effectiveness for all courses in the college was about 3.70. We use this as the baseline at the beginning of GSB's broader quality improvement effort. We note that the mean level of

Course Effectiveness improved over time, stabilizing at about 4.00 after several years. This improvement in mean scores for Course Effectiveness (i.e., +.30) was both substantial for such this measurement scale and statistically significant ($t = 8.16, p < .001$).

Insert Table 2 about here

We next present a graph (Figure 1) of Course Effectiveness ratings for all courses over the seven-year period, in order to more clearly reveal the trend of scores over time. With some minor fluctuations, the graph indicates a consistent trend of positive growth in student perceptions of Course Effectiveness. To test the statistical significance of this growth trend, we established mixed models by fitting higher order polynomials in the same fashion to each assessment dimension over time. Three terms were included in the models, presenting linear, quadratic (U-shaped), and cubic (S-shaped) relationships between time and course evaluations respectively. Because instructors taught for varying lengths of time in the college, and taught varying number of courses within each trimester, the repeated measure was a product of time (20 trimesters coded from 1 to 20) and course sections taught by individual instructors within each trimester. Individual instructors were included in each mixed model as a random factor.

Insert Figure 1 about here

The results of the estimates of intercepts and three shape (i.e., growth) terms for each assessment dimension are presented in Table 3. The significant results with the Linear term reinforce the finding of a consistent rate of growth in evaluations of instructional effectiveness over the seven years. Significant results with the Quadratic and Cubic terms would suggest that the rate of growth or decline changed over time. However, a closer examination of estimates reveals that the magnitude of estimates with the Quadratic and

Cubic terms was trivial (less than .01). Therefore, these significant findings most likely resulted from the large sample size. As we can see in Figure 1, in general, there was a fairly constant rate of growth, except for some declines in the 5th and 6th terms in 2002.ⁱⁱⁱ This finding is important because it suggests that in subsequent analyses the PBL Courses are being assessed against a high quality standard of teaching and learning in the college (i.e., as perceived by the students).

Insert Table 3 about here

We also wish to call attention to the pattern of variance in the ratings of Course Effectiveness (see Table 2 and Figure 2). Analysis of variation in course ratings offers an essential complement to the previous analysis of mean scores (Scriven, 1988). First, the PBL Courses demonstrated significantly lower variance (seven-year average SD = .38) in the rating of Course Effectiveness across class sections over time than Other Courses (seven-year average SD = .44). Moreover, the magnitude of variance among PBL Courses tended to decrease over time. Taken together, these data suggest a higher level of improvement, more consistent growth, and greater stability in the delivery of the PBL Courses over a substantial period of time. Again, we note that this analysis draws on a large sample of course sections and instructors.

Insert Figure 2 about here

Next we employed growth modeling techniques to compare PBL Courses with Other Courses on specific dimensions of instructional effectiveness. As reported in Table 2, preliminary Independent samples *t*-tests indicated that students reported significantly higher scores for PBL Courses on three dimensions: Action-Directed Learning (mean difference = .05, $t = 1.96$, $p < .05$), Engagement (mean difference = .08, $t = 3.63$, $p < .001$), and

Assessment and Feedback (mean difference = .10, $t = 4.64$, $p < .001$). The differences were, however, neither significant for ratings of Course Effectiveness (mean difference = .01, $t = .40$, $p = \text{n.s.}$), nor for Instructor Effectiveness (mean difference = -.01, $t = -.41$, $p = \text{n.s.}$).

We then used mixed-effects models to exploit the longitudinal feature of the dataset. This test was used to estimate the associations between instructional approaches and students' perceptions of instructional effectiveness while accounting for correlations between repeated observations on the same individual instructors. The earlier trend analyses had revealed that the dominant shape of the change trend was linear and that the lines of the two instructional groups intersected at several time points. Therefore, we included three fixed effect factors in the model: instructional approach, the linear term of academic trimester, and the interaction term between instructional approach and academic trimester. Furthermore, all models included random intercepts for academic trimesters and individual instructors. Therefore, in each model, we included factors that were of interest *a priori*, but with a particular focus on the association between instructional approach and the five assessment dimensions.

Insert Table 4 about here

The results of the mixed-effects models (see Table 4) are generally consistent with the t -tests results (see Table 3). There was a positive main effect of time on student evaluations of courses on all three assessment dimensions. Involvement in PBL Courses monotonically increased student perceptions on Action-Directed Learning (estimate of fixed effect = .13, $p < .10$), Student Engagement (estimate of fixed effect = .14, $p < .05$), and Assessment and Feedback (estimate of fixed effect = .10, $p < .10$). PBL Courses did not significantly affect students' evaluation of the different instructional approaches on Course Effectiveness and Instructor Effectiveness. We accepted these results at a significance level of .10 because the magnitude of the effects conveyed meaningful practical significance (Schutz, 1966). The

results also indicate that the interaction effects between time and instructional approach were not significant on the five assessment dimensions.

Conclusion

At the outset of this paper we noted that empirical findings on the effectiveness of PBL in higher education have come primarily from studies conducted in medical schools. The current study sought to address this gap by reporting findings from a longitudinal, non-experimental evaluation of a systematic, long-term effort to implement a PBL track in a Master of Management program in Thailand. In this section, we summarize the results and place them in perspective both with respect to the use of problem-based learning in management education and higher education more generally in East Asia.

Summary and Limitations of Results

The broad results suggest that GSB was successful in improving the quality of teaching and learning in the college during the period of the study. We wish to note that although PBL became a signature feature of the college, GSB did not explicitly favor any one approach to teaching and learning. The faculty's college's goal was to create an active, engaging learning environment through the use of what Edgerton (2001) termed 'pedagogies of engagement' including PBL, traditional case teaching, video cases, simulation, role play and learner-centered video-enriched lectures. Data depicting trends in student perceptions of Course and Instructor Effectiveness over time at GSB suggest that this was largely accomplished.

This provides an important contextual point for interpreting findings of no significant differences between PBL and Other Courses on ratings of Course and Instructor Effectiveness. We interpret this finding to suggest that both groups of courses were being delivered at a reasonably high level of quality. Even so, we also noted a significantly lower

level of variance in ratings of the PBL Courses. In statistical terms teaching quality is achieved when two conditions are present: *both* high mean scores and low variance across instructors and courses (Scriven, 1988). This pattern of results would suggest that students perceive that the college is consistently offering high quality instruction with fewer instances of poorly taught courses. This perspective on teaching quality is especially relevant for institutions, such as GSB, that depend heavily on student tuition and operate in highly competitive markets. The data reported here indicate quite conclusively that the PBL Courses were not only achieving a high overall standard of instructional effectiveness, but also with greater consistency in results.

Moreover, the PBL Courses demonstrated significantly stronger ratings on the learning dimensions of Action-Directed Learning, Student Engagement, and Assessment and Feedback. Growth modeling further revealed trends in which these features effective learning strengthened over time. Thus we noted that it took a period of several years for the PBL track to achieve its full potential. This finding would have been missed in a more typical cross-sectional study or even in a longitudinal study of shorter duration. Taken together, these results support a conclusion that PBL was offering a strong and stable platform for learner-centered instruction in the Master degree program.

Student course evaluation ratings have often been treated with skepticism in academia (Aleamoni, 1999). We join others, however, in suggesting that when they are properly designed and administered, these ratings can offer insights that are difficult to achieve through other means of data collection (Aleamoni, 1999; Lyon & Hendry, 2002; Scriven, 1988). As noted earlier, this study drew upon a scale that was designed and administered with potential threats to validity in mind (Aleamoni, 1999; Latham & Wexley, 1981; Scriven, 1988).

Nonetheless, we also acknowledge that this approach to measuring ‘instructional effectiveness’ only offers one perspective on teaching quality. It does not measure achievement of course goals, or changes in student knowledge acquisition and retention, and skill transfer. Thus, we recognize that the evaluation of PBL offered in this report is still incomplete and by no means represents a comprehensive endorsement of problem-based learning in management education.

Implications of the Study

Twenty years ago the senior author attended a training program on problem-based learning for university faculty held at the Harvard University Graduate School of Medicine. During the three-day program, participants were offered the opportunity to attend a session in which Professor C. R. Christensen demonstrated the case teaching method as employed at the Harvard Business School. Professor Christensen, considered by some a ‘father’ of the case method of teaching, skillfully led a case discussion with a group of over 100 participants in a theatre-like classroom. At the conclusion of the demonstration lesson, a seminar attendee was asked why PBL was not used in the Business School at Harvard. Professor Christensen replied that it was a case of ‘educational economics’. The use of tutorial groups in PBL required a level of instructor resources that was not considered cost-effective.

Professor Christensen’s response highlighted a limitation of PBL, resource intensiveness, but failed to address the potential tradeoff in *instructional effectiveness*. That is, his response *assumed* that large-class case-based teaching is able to obtain similar effects as PBL and other ‘pedagogies of engagement’ (see Williams, 1992). Despite the widespread acceptance of case teaching in management education, this assumption has not to our knowledge been empirically tested (Hallinger & Bridges, 2007; Williams, 1992). We do note, however, that the Harvard Business School recently instituted a program aimed at enhancing the quality of case-based teaching through participant-centered learning (HBS, 2008).

The evidence presented in this report supports the belief that PBL can make an important contribution to learning in higher education. As one ‘pedagogy of engagement’ PBL appears to have advantages when it comes to creating an action-directed learning environment that assists students in learning how to apply knowledge. Moreover, as evidenced by the consistency in ratings on these dimensions over time, this study suggests that instructors and students adapted very well to this learner-centered, cooperative approach to learning.

We also wish to note that PBL implementation at GSB served as an unobtrusive engine of innovation in teaching and learning across the college. Innovations embedded in the PBL curriculum gradually migrated to other parts of the curriculum as instructors in the *Consulting Practice Track* began to share new teaching practices with colleagues in other team-based courses (e.g., Core and Foundation courses). This resulted in an increased use of video cases, skill-oriented learning tasks, performance-based assessments, and cooperative group learning at GSB.

Finally, we wish to comment on the response of Asian students to the problem-based management curriculum. Earlier, Kember (2000) made the following claim in response to those who have claimed that teacher-directed instruction is preferred by and represents a more suitable model of learning for Asian students:

The evidence of high achievement by Asian students has not been questioned. Indeed there may well be a potential for better performance still. It is clear that common mis-perceptions of the learning approaches and preferences of Asian students have resulted in the adoption of didactic teaching methods and assessment and examinations which test recall. If the academics concerned realise that Asian students are capable of more active forms of learning and benefit from curricula which demand higher forms of learning, the performance could be better still. (Kember, 2000, p. 117)

Our data offer insight into this issue at least with respect to Asian student studying in a business education program in Thailand. As suggested by the data, student response was very positive. By the second year of implementation, over 90% of students were electing the *Consulting Practice Track* over other capstone options and this trend continued throughout the subsequent terms. Students were voting with their feet despite the extremely heavy workload in the PBL track. A typical comment was reflected by a student during the third year of implementation. “What we learn in class today, we can use in our work tomorrow.” PBL clearly appealed to students who were working in local Thai as well as multi-national companies.

Of course no single case study can offer a definitive answer regarding the efficacy of a particular teaching approach. Nonetheless, we suggest that the results of this study represent convincing evidence that PBL and other active learning methods can be successfully adopted in East Asian higher education. Moreover, the study provides an empirical basis for further studies that examine the use of active learning in Asian higher education. In particular, it the future agenda for research on problem-based management education should examine the learning results of students and the transfer of learning to the workplace. This will make it possible to determine if the characteristics of active learning for understanding explored in this study carry over into the ability to retain and transfer knowledge where it counts, in students’ careers and in their lives.

References

- Aleamoni, L. (1999). Student ratings myths versus research facts from 1924 to 1998. *Journal of Personnel Evaluation in Education*, 13(2), 153-166.
- Altbach, P. (2004). Higher education crosses borders. *Change*, 35, 18-25.
- Altbach, P., & Umakoshi, T. (Eds.; 2004). *Asian universities: Historical perspectives and contemporary challenges*. Baltimore, Maryland: John Hopkins University Press.
- Barnes, L., Christensen, C., & Hansen, A. (1994). *Teaching and the case method* (3rd Edition). Cambridge, MA: Harvard Business School Press.
- Barrows, H., & Tamblyn, R. (1980). *Problem-based learning: An approach to medical education*. New York: Springer.
- Bennis, W., & O'Toole, J. (2005, May). How business schools lost their way. *Harvard Business Review*, 96-104.
- Biggs, J. (1994). Asian learners through Western eyes: An astigmatic paradox. *Australian and New Zealand Journal of Vocational Education Research*, 2(2), 40-63.
- Biggs, J. (1996). Western misperceptions of the Confucian-heritage learning culture. In D. Watkins. and J. Biggs, (Eds.), *The Chinese learner: Cultural, psychological and contextual influences* (pp. 45-67). Melbourne and Hong Kong: Australian Council for Educational Research and the Comparative Education Research Centre, University of Hong Kong.
- Bok, D. (1989). Needed: A new way to train doctors. In H. Schmidt, M. Lipkin, M. de Vries, & J. Greep (Eds.), *New directions in medical education* (pp. 17-38). New York: Springer Verlag.
- Boud, D. & Feletti, G. (1991). *The challenge of problem-based learning*. New York: St. Martin's Press.

- Bransford, J. (1993). Who ya gonna call? In P. Hallinger, K. Leithwood, & J. Murphy (Eds.), *Cognitive perspectives on educational leadership*. New York: Teachers College Press.
- Bridges, E. (1977). The nature of leadership. In L. Cunningham, W. Hack, & R. Nystrand, *Educational administration: The developing decades* (pp. 202-230). Berkeley, CA: McCutchan.
- Bridges, E. & Hallinger, P. (1995). *Implementing problem-based learning in leadership education*. Eugene, OR: ERIC Clearinghouse for Educational Management.
- Bridges, E. & Hallinger, P. (1993). Problem-based learning in medical and managerial education. In P. Hallinger, K. Leithwood, & J. Murphy (Eds.), *Cognitive perspectives on educational leadership*. New York: Teachers College Press.
- Bridges, E., & Hallinger, P. (1999). The use of cases in problem based learning. *The Journal of Cases in Educational Leadership*, 2(2), 4-13.
- Brownell, J., & Jameson, D. (2004). Problem-based learning in graduate management education: An integrative model and interdisciplinary application. *Journal of Management Education*, 28(5), 558-577.
- Buckley, R., Wren, D., & Michaelson, L. (1992). The role of management experience in the management education process: Status, problems and prospects. *Journal of Management Education*, 16(3), 303-313.
- Cheng, Y.C. (2010, January). *Building capacity for school leadership research and development in the Asia-Pacific region*. Paper presented at the Asia Leadership Roundtable 2010. Hong Kong Institute of Education, Hong Kong.
- Christensen, C. R. (1987). *Teaching and the case method: Text, cases and readings*. Boston: Harvard Business School.

- Christensen, C. R. (1991). The discussion teacher in action: Questioning, listening, and response. In C. Christensen, D. A. Garvin, & A. Sweet (Eds.), *Education for judgment*. Boston, MA: Harvard Business School Press.
- Colliver, J. (2000). The effectiveness of problem-based learning curricula: Research and Theory, *Academic Medicine*, 75, 259-266.
- Copland, M. (2000). Problem-based learning and prospective principals' problem-framing ability, *Educational Administration Quarterly*, 36(4), 585-607.
- Davies, R. (1994). From cross-sectional to longitudinal analysis. In R. Davies and A. Dale (Eds.), *Analyzing social & political change: A casebook of methods* (pp. 20-40). Newbury Park, CA: Sage.
- Edgerton, R. (2001). *Education white paper*. Report prepared for the Pew Charitable Trusts, Pew Forum on Undergraduate Learning. Washington, DC.
- Engel, C. (1991). Not just a method, but a way of learning. In D. Boud & G. Feletti (Eds.), *The challenge of problem-based learning* (pp. 22-33), New York: St. Martin's Press.
- Evenson, D., & Hmelo, C. (2000). *Problem-based learning: a research perspective on learning interactions*. New Jersey, Lawrence Erlbaum Associates
- Garvin, D. A. (2003, Sept.-Oct.). Making the case: Professional education for the world of practice. *Harvard Magazine*.
- Gijbels, D., Dochy, F., Van den Bossche, P., & Segers, M. (2005). Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of Educational Research*, 75(1), 27-61.
- Gijsselaers, W., Templaar, D., Keizer, P., Bernard, E., & Kasper, H. (Eds.; 1995). *Educational innovation in economics and business administration: The case of problem-based learning*. Dordrecht, The Netherlands: Kluwer.

Gragg, C. (1941, October 19). Because wisdom can't be told. *Harvard Alumni Bulletin*.

Reprinted by Harvard Business School, HBS Case #451-005.

Hallinger, P., & Bridges, E. (2007). *Preparing managers for action*. Dordrecht, Netherlands: Springer.

HBS. (2008). *Global colloquium on participant-centered learning*. Harvard Business School, Cambridge, MA. Retrieved on January 12, 2009 from <http://www.exed.hbs.edu/programs/gcpcl/>.

Heck, R. H., Thomas, S. L., & Tabata, L. N. (2010). *Multilevel and longitudinal modeling with IBM SPSS*. New York: Routledge Academic.

Heskett, J. (2005, July 4). How can business schools be made more relevant? *Harvard Business School Working Knowledge for Business Leaders*, <http://hbsswk.hbs.edu/item/4886.html>.

Huber, G., & Van de Ven, A. (1995). Introduction. In G. R Huber & A. H. Van de Ven (Eds.), *Longitudinal field research methods: Studying processes of organizational change* (vii-xiv). Thousand Oaks, CA: Sage.

Kember, D. (2000). Misconceptions about the learning approaches, motivation and study practices of Asian students. *Higher Education*, 40, 99-121.

Kimber, D. (1996). Collaborative Learning in management education: Issues, benefits, problems and solutions: A literature review. *Ultibase Articles*. <http://ultibase.rmit.edu.au/Articles/june96/kimbe1.htm>.

Kloppenborg, T., & Baucus, M. (2003, August). *Problem-based learning: Teaching project management while solving real organizational problems*. Best Paper Proceedings, National Academy of Management Meeting, Seattle, WA.

- Latham, G., & Wexley, K. (1981). *Increasing productivity through performance appraisal*. Menlo Park, CA: Addison Wesley.
- Levine, A. (2005). *Educating school leaders*. The Education Schools Project.
- Lyon, P., & Hendry, G. (2002). The use of the course experience questionnaire as monitoring evaluation tool in a problem-based medical programme. *Assessment & Evaluation in Higher Education*, 27(4), 339-352.
- Margetson, D. (1991). Why is problem-based learning a challenge? In D. Boud & G. Feletti (Eds.), *The challenge of problem-based learning* (pp. 42-50). New York: St. Martin's Press.
- Major, C., & Palmer, B. (2001). Assessing the effectiveness of problem-based learning in higher education: Lessons from the literature. *Academic Exchange*, 5(1), 1-2.
- Merchant, J. (1995). Problem-based learning in the business curriculum. An alternative to traditional approaches. In W. Gijselaers, D. Tempelaar, P. Keizer, E. Bernard, & H. Kasper (Eds.), *Educational innovation in economics and business administration: The case of problem-based learning* (pp. 261-267). Dordrecht, The Netherlands: Kluwer.
- Milner, R., & Stinson, J. (1995). Educating leaders for the new competitive environment. In W. Gijselaers, D. Tempelaar, P. Keizer, J. Blommaert, E. Bernard, & H. Kasper (Eds.), *Educational innovation in economics and business administration: The case of problem-based learning* (pp. 30-38). Dordrecht: Kluwer Academic Publishers.
- Mintzberg, H. (2002). *Managers, not M.B.A.s*. San Francisco: Berrett-Kohler.
- Murphy, J. (2006). *Preparing school leaders: An agenda for research and action*. Lanham, MD: Rowman & Littlefield.

- Norman, G. (1988). Problem-solving skills, solving problems and problem-based learning. *Medical Education*, 22, 279-286.
- Norman, G., & Schmidt, H. (1992). The psychological basis of problem-based learning: A review of the evidence. *Academic Medicine*, 67, 557-565.
- Pfeffer, J., & Wong, C. (2004). The business school 'business': Some lessons from the US experience. *Journal of Management Studies*, 41(8), 1501-1520.
- Romm, T., & Mahler, S. (1991). The case study challenge: A new approach to an old method. *Management Education and Development*, 22(4), 292-301.
- Romme, A. G. L., & Putzel, R. (2003). Designing management education: Practice what you teach. *Simulation & Gaming*, 34(4), 512-530.
- Savin-Baden, M., & Wilkie, K. (2004, Eds.). *Challenging research in problem-based learning*. Maidenhead, UK: Open University Press.
- Schmidt, H. (1983). Problem-based learning: Rationale and description, *Medical Education*, 17, 11-16.
- Schutz, R. (1966). The control of "error" in educational experimentation. *The School Review*, 74(2), 150-158.
- Scriven, M. (1988). The validity of student ratings. *Instructional Evaluation*, 92(2), 5-18.
- Shaw, S.M. (1999, May, 31). It's true. Asians can't think. *Time*, 23.
- Sherwood, A. (2004). Problem-based learning in management education: A framework for designing content. *Journal of Management Education*, 28(5), 536-557.
- Singer, J. D. & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York: Oxford University Press.

- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*(4), 571-581.
- Smith, K., Sheppard, S., Johnson, D., & Johnson, R. (2005). Pedagogies of engagement: Classroom-based practices. *Journal of Engineering Education, 94*(1), 1-15.
- Stinson, J., & Milter, R. (1996). Problem-based learning in business education: Curriculum design and implementation issues. *New Directions in Teaching and Learning, 68*, 33-42.
- Tweed, R., & Lehman, D. (2002). Learning considered within a cultural context: Confucian and Socratic approaches. *American Psychologist, 57*(2), 89-99.
- Vansteenkiste, M., Zhou, M., Lens, W., & Soenens, B. (2005). Experiences of autonomy and control among Chinese learners: Vitalizing or immobilizing? *Journal of Educational Psychology, 97*(3), 468-483.
- Walker, A., Bridges, E., & Chan, B. (1996). Wisdom gained, wisdom given: Instituting PBL in a Chinese culture. *Journal of Educational Administration, 34*(5), 12-31.
- Walton, H., & Matthews, M. (1989). Essentials of problem-based learning, *Medical Education, 23*, 542-558.
- Watkins, D. (2001). Correlates of approaches to learning: A cross-cultural analysis. In R. Sternberg and L. F. Zhang (Eds.), *Perspectives on thinking, learning, and cognitive styles* (pp. 165-196). Mahwah, N. J.: Lawrence Erlbaum Associates.
- Watkins, D. (2000). Learning and teaching: A cross-cultural perspective. *School Leadership & Management, 20*(2), 161-173.
- Williams, S. (1992). Putting case-based instruction into context: Examples from legal and medical education. *The Journal of the Learning Sciences, 2*(4), 367-427.

Yost, E., & Keifer, J. (1998). Application of problem-based learning pedagogy to management education. In R. Milter, J. Stinson, & W. Gijsselaers (Eds.), *Educational innovation in economics and business III: Innovative practices in business education* (pp. 283-302). Dordrecht, Kluwer Academic Publishers.

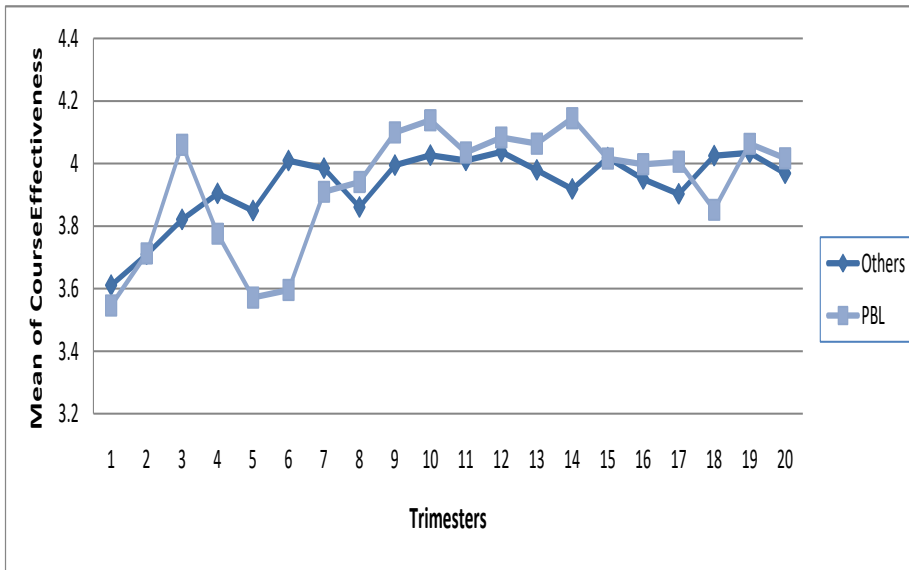


Figure 1. Mean Course Effectiveness Ratings: 2001-2007

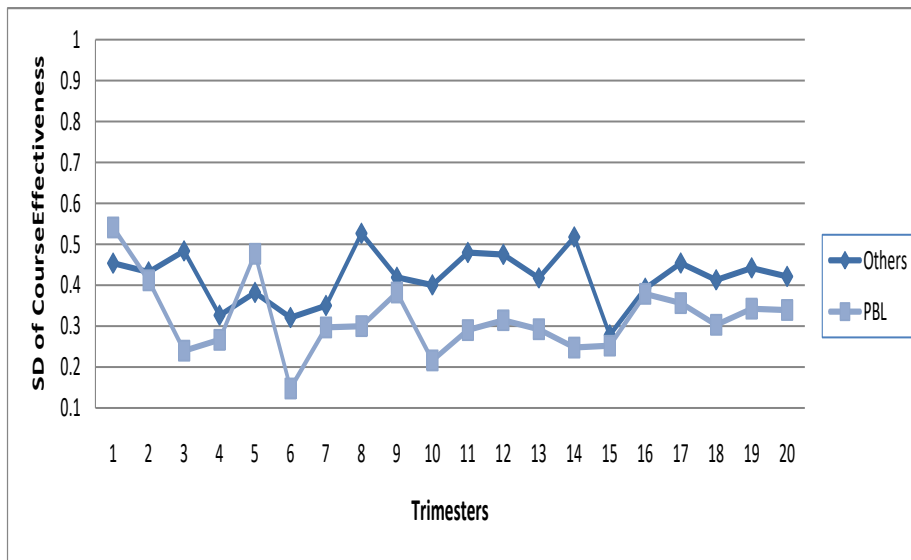


Figure 2. Standard Deviations of Course Effectiveness Ratings: 2001-2007

Table 1. *Summary of Course, Instructor, Student Information: 2001-2007*

Students, Instructors and Classes	PBL Courses	Other Courses	Total
Number of Course Sections	431	1,461	1,892
Number of Instructors	49	235	256 ^a
Average Students per Section	23.27	20.16	24.42
Total Number of Students	10,031	36,168	46,199
Total Returned Questionnaires	9,084	29,454	38,538
Response Rate	91%	81%	83%

Note:

a. 28 instructors taught both PBL classes and other classes, and they were treated as two separate individual instructors in the analyses.

Table 2. Descriptive Statistics for the Five Assessment Dimensions

Dimensions	N of items	Alpha	2001 ^a M (SD)	2002 M (SD)	2003 M (SD)	2004 M (SD)	2005 M (SD)	2006 M (SD)	2007 ^b M (SD)	Total M (SD)	<i>t</i>	Sig.
1. Course Effectiveness	1	—										
PBL			3.72(.47)	3.65(.37)	3.96(.32)	4.08(.27)	4.09(.26)	3.95(.35)	4.04(.34)	3.93(.38)	.40	<i>n.s.</i>
Other Courses			3.70(.46)	3.92(.35)	3.94(.45)	4.02(.45)	3.97(.43)	3.96(.42)	4.00(.43)	3.92(.44)		
2. Instructor Effectiveness	4	0.95										
PBL			3.89(.39)	3.87(.35)	4.13(.29)	4.28(.25)	4.28(.26)	4.15(.32)	4.22(.33)	4.12(.35)	-.41	<i>n.s.</i>
Other Courses			3.91(.40)	4.13(.31)	4.16(.37)	4.21(.41)	4.21(.38)	4.15(.41)	4.18(.42)	4.13(.40)		
3. Action-Directed Learning	2	0.95										
PBL			3.75(.44)	3.71(.40)	4.03(.30)	4.17(.31)	4.20(.26)	4.03(.35)	4.11(.34)	4.00(.39)	1.96	*
Other Courses			3.71(.40)	3.96(.36)	3.99(.41)	4.08(.44)	4.05(.44)	3.95(.47)	3.99(.48)	3.95(.45)		
4. Student Engagement	2	0.95										
PBL			3.78(.40)	3.70(.40)	4.03(.30)	4.14(.28)	4.21(.28)	4.06(.31)	4.11(.34)	4.01(.37)	3.63	***
Other Courses			3.65(.40)	3.91(.34)	3.96(.40)	4.02(.45)	4.01(.41)	3.97(.42)	4.00(.43)	3.92(.43)		
5. Assessment & Feedback	2	0.90										
PBL			3.66(.34)	3.65(.35)	4.03(.32)	4.12(.26)	4.13(.25)	4.03(.30)	4.11(.31)	3.97(.36)	4.64	***
Other Courses			3.63(.38)	3.84(.35)	3.89(.38)	3.95(.42)	3.94(.37)	3.91(.40)	3.96(.41)	3.87(.40)		

Note: M = Mean; SD = Standard Deviation; *n.s.* = not significant; * = $p < .05$; ** = $p < .01$.

a. The statistics in the columns 2001 to 2006 integrated the data of three trimesters each year.

b. The statistics in the column of 2007 integrated data of two trimesters in 2007.

Results of Testing the Shape of Trend

	Course Effectiveness			Instructor Effectiveness			Action-directed Learning			Student Engagement			Assessment and Feedback		
	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.
Intercept	3.51	0.04	***	3.71	0.04	***	3.47	0.04	***	3.46	0.04	***	3.45	0.03	***
Time (Linear)	0.08	0.01	***	0.06	0.01	***	0.09	0.01	***	0.08	0.01	***	0.09	0.01	***
Time (Quadratic)	-0.01	0.00	***	0.00	0.00	***	-0.01	0.00	***	-0.01	0.00	***	-0.01	0.00	***
Time (Cubic)	0.00	0.00	***	0.00	0.00	***	0.00	0.00	***	0.00	0.00	***	0.00	0.00	***

Note: SE = Standard Error; n.s. = not significant; *** = $p < .001$.

. Estimates of Fixed Effects for Five Assessment Dimensions

	Course Effectiveness			Instructor Effectiveness			Action-directed Learning			Student Engagement			Assessment and Feedback		
	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.	Estimate	SE	Sig.
Intercept	3.65	.03	***	3.85	.03	***	3.64	.03	***	3.61	.04	***	3.58	.03	***
Time (Linear)	.01	.00	***	.01	.00	***	.01	.00	***	.01	.00	***	.01	.00	***
Instructional Approach (0= Others; 1=PBL)	.06	.07	n.s.	.03	.07	n.s.	.13	.07	†	.14	.07	*	.11	.06	†
Instructional Approach * Time (Linear)	.01	.00	n.s.	.01	.00	n.s.	.00	.00	n.s.	.00	.00	n.s.	.00	.00	n.s.

Note: SE = Standard Error; n.s. = not significant; † = $p < .10$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

ⁱ The authors would like to thank Prof. Ronald Heck for his valuable assistance in helping to structure the longitudinal analysis employed in this study. We also acknowledge useful comments by Prof. Edwin Bridges and Prof. Lo Sing Kai as well as assistance in development of the data set by Associate Professor Parinya Showanasai, and Apichai Somboonpakorn.

ⁱⁱ Note that a full description of the curriculum design and instructional units is offered in Hallinger & Bridges, 2007.

ⁱⁱⁱ Two factors could account for the divergent findings in 2002. First there was a political conflict resulting in turnover among several senior administrators. Second, during this term, several new PBL modules were introduced simultaneously. It typically took two or three terms to “break in” a new module and achieve a reasonable level of stability in implementation across instructors.