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Research notes

What is the best way to develop new managers? Problem-based learning vs. lecture-based instruction

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ABSTRACT

What is the best way to develop the next generation of managers and leaders? The present study takes aim at directly comparing the effectiveness of problem-based learning with the more traditional, lecture-based instruction, as well as a hybrid approach, on student learning in the management classroom. It seems clear from the literature on problem-based learning in medical schools that problem-based learning has a positive impact on the acquisition of problem-solving skills but either a negative impact or no impact on knowledge acquisition. The present study was designed to directly assess the differential impact of problem-based learning and lecture-based instruction on both the acquisition of problem-solving skills, specifically critical thinking skills, and knowledge acquisition in the management classroom. Findings parallel those found in medial school classrooms. Implication for instruction and curriculum design in the management classroom are considered.

What is the best way to develop the next generation of managers and leaders? Typically, we put the prospective managers and leaders through a business school curriculum so that they earn their Bachelors Degree, then send them off to graduate school to get their MBA. And typically, through this process, we deliver to them all the information they will need by lecture. Maybe in the MBA program we mix in case studies and case analysis. Maybe in the undergraduate curriculum we have students work in teams on various simulated or "real-world" projects. But we mostly lecture … and assess content learning and knowledge acquisition for the material we lectured on. Fairly recently, in the last 10 years, based primarily on work conducted in medical schools, there has been a push to move management and leadership education away from the traditional lecture-based approach to something new … problem-based learning.

One issue with problem-based learning is that there have been two approaches to understanding problem-based learning. There is the theory approach focused on what scholars think about problem-based learning. And this approach generally supports problem-based learning and the idea of problem-based learning as superior to lecture-based instruction. Then there is the empirical approach focused on actual evidence for the effectiveness of problem-based learning. And this approach generally shows that the theoretical promise of problem-based learning falls short empirically. In other words, the research does not support the theoretical promise of problem-based learning. Scholars need to be more precise about where we can show empirical support for the theoretical promise of problem-based learning.

Another issue with problem-based learning is that problem-based learning sounds remarkable like case-based learning that would be familiar to anyone having received an MBA or having taught in an MBA program.

This report will show that, under the right circumstances, with the right learning outcomes, problem-based learning does lead to better problem-solving skills, however, lecture-based instruction leads to better knowledge acquisition. And a hybrid of the two produces the best learning outcome.

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1. What is problem-based learning

Problem-based learning is an approach to instruction that is learner-centric rather than instructor-centric and empowers learners to explore a topic on their own through research, integration of theory and practice, and application of knowledge in the context of a real-world problem the learner must solve (Savery, 2006). Problem-based learning is differentiated from traditional, lecture-based instruction by employing a real-world problem that engages the learner in active exploration rather than providing the learner with passive reception of lecture material (Peterson, 2004). The underlying assumption is that through the process of engaging with the real-world problem the learner learns.

Obviously, critical to this process of problem-based learning is the development and delivery of the real-world problem. And the specific type of real-world problem employed is the hallmark of problem-based learning. The real-world problem must be "ill-structured and allow for free inquiry" (Savery, 2006, p. 13). The ill-structured nature of the problem along with its real-world focus theoretically motivates learners to identify the core issues presented in the problem, identify what information and knowledge is needed to solve the problem, place parameters on the types of solutions that will be successful in solving the problems, and engage in self-directed learning in order to solve the problem (Peterson, 2004; Savery, 2006; Smith, 2005).

Problem-based learning is typically characterized by five key features (Newman, 2005). These include: 1. The instructor acts as facilitator of learning rather than deliverer of content; 2. The process of solving the ill-structured, real-world problem must follow a designed script; 3. The use of the ill-structured, real-world problem contextualizes the learning and allows for integration of the learning; 4. The nature of the ill-structured, real-world problem is such that learning must be collaborative; and 5. Learning within the context of the ill-structured, real-world problem must be assessed in relation to the goals or objectives of the learning.

As Carriger (2015) pointed out, the above may sound familiar to instructors teaching in an MBA curriculum, as many MBA programs employee a case-based instructional approach, at least partially. However the purveyors of problem-based learning go to some lengths to differentiate problem-based learning from case-based instruction. "While cases and projects are excellent learner-centric instructional strategies, they tend to diminish the learner's role in setting the goals and outcomes for the 'problem'. When the expected outcomes are clearly defined, then there is less need or incentive for the learner to set his/her own parameters" (Savery, 2006, p.16). As Savery and Duffy (1995) note, the primary difference between problem-based learning and case-based instruction is the nature of the problem or case presented and the sequence in which the problem or case and other learning materials are presented. For example, in case-based instruction the case is typically presented after the learning material and used as a mechanism to check on or assess the learning of the material. In problem-based learning the problem is presented before any other learning material and it is the task of the learner to figure out what he or she must learn in order to solve the problem.

Problem-based learning has a rather extensive history in medical schools (Hmelo-Silver, 2004; Dochy, Segers, Van den Bossche, & Gijbels, 2003), yet problem-based learning has only relatively recently been considered in the management classroom (Bigelow, 2004; Sherwood, 2004). The present study takes aim at directly comparing the effectiveness of problem-based learning with the more traditional, lecture-based instruction on student learning in the management classroom.

2. What is the evidence in support of problem-based learning?

Very little has actually been done looking at the effectiveness of problem-based learning, particularly in the management classroom. A bit more has been done looking at the effectiveness of problem-based learning in the medical school classroom. But even here there is a dearth of studies directly comparing learning outcomes of problem-based learning and traditional, lecture-based instruction.

Although the medical school classroom, with its quite different disciplinary focus and significant consequences for failure, might be considered a poor analog for pedagogy in the management classroom, Sherwood (2004, Carriger, 2015) notes a level of similarity in the processes of education that makes the analog potentially useful. Within the medical school curriculum problem-based learning emerged as a way to address apathy and boredom that can arise in medical school students historically exposed to a memorization and repetition approach to medical education (Newman, 2005). Additionally, in the medical school pedagogy problem-based learning has been conceived of as bridging the gap between medical theory and medical practice (Sherwood, 2004). Both issues may be relevant within the management classroom: need for engaging pedagogy and bridging the gap between theory and practice. But, perhaps more importantly, the medical school curriculum and the management curriculum have two important similarities (Sherwood, 2004), in both settings solving problems are at the center of the education and in both settings the ultimate learning outcome is the development of professionally useful knowledge, the development of problem solving or reasoning skills, the development of a self-directed learning attitude, and fostering a collaborative learning environment (Sherwood, 2004). However, the stakes and disciplines involved do differ. For example, educational outcomes in a medical school setting have real life and death consequences, which are not present in the management classroom, and the process of education with regards to the ready availability of real-world problems and rapid feedback differ. Which suggests that the promise of problem-based learning in the medical school classroom may not inform the use of the problem-based learning in the management classroom. This highlights the need to directly assess that promise in the management classroom.

The earliest attempt at assessing the learning outcomes of problem-based learning was in the medical school classroom and summarized in a meta-analytic study conducted by Albanese and Mitchell (1993). These authors looked at all studies they could find that compared problem-based learning to more traditional, lecture-based learning in medical schools between the years 1972 and 1993. The authors found 18 studies that directly compared problem-based learning and lecture-based instruction in the medical school setting. The authors concluded that the 18 studies yielded mixed results for problem-based learning: problem-based learning seemed to improve the acquisition of problem solving skills while actually decreasing the acquisition of knowledge; lecture-based instruction seemed to have little impact on acquisition of problem solving skills yet positively impacted the acquisition of knowledge.

A second meta-analytic study conducted concurrently, though independently, and also summarizing results from the medical school classroom, by Vernon and Blake (1993) found essentially the same result. These authors found 22 published reports focused on the effectiveness of problem-based learning over a similar time period. This replication found essentially the same result: problem-based learning improved problem solving skills, whereas lecture-based instruction improved knowledge acquisition skills.

More recently Dochy et al. (2003) employed meta-analytic techniques to summarize the learning effectiveness of problem-based learning and lecture-based instruction in 43 published reports within the medical school context between 1984 and 2000. These authors again found the same mixed results for problem-based learning: problem-based learning improved problem solving skills but not knowledge acquisition.

A smattering of much more recently published works have looked at the effectiveness of various aspects of problem-based learning in engineering schools and the management classroom. However, a majority of these are theoretical (e.g., Stinson & Milter, 1996; Milne & McConnell, 2001; Brownell & Jameson, 2004; DeFillippi & Milter, 2009) rather than empirical. And those that report any empirical findings, do not directly compare learning outcomes for problem-based learning and lecture-based instruction (see for example, Hsieh & Knight, 2008; Mitchell, Canavan, & Smith, 2010; Downing, Ning, & Shin, 2011; Bamford, Karjalainen, & Jenavs, 2012; Stanley & Marsden, 2012; Hartman, Moberg, & Lambert, 2013). For an in-depth review of these more recent works see Carriger (2015).

It seems clear from the literature on problem-based learning in medical schools that problem-based learning has a positive impact on some learning outcomes, the acquisition of problem-solving skills; but either a negative impact or no impact at all on other learning outcomes, knowledge acquisition. Carriger (2015) has addressed the issue of learning outcomes and problem-based learning, noting that at least theoretically a shift in pedagogical understanding of problem-based learning would lead to a shift in focus on learning outcomes associated with problem-based learning and lecture-based instruction. However, the relevant empirical work to date, whether in the medical school classroom or the management classroom, is somewhat older and has shown mixed results in terms of impact on learning outcomes. The present study aims at addressing this lack. The present study was designed to directly assess the differential impact of problem-based learning and lecture-based instruction, as well as a hybrid of the two, on learning outcomes associated with both the acquisition of problem-solving skills, specifically critical thinking skills; and knowledge acquisition in the management classroom.

Theoretically, there is some suggestion that problem-based learning should differentially impact learning outcomes associated with critical thinking skills and knowledge acquisition when compared with lecture-based instruction (Carriger, 2015). Therefore, in the management classroom one would expect problem-based learning to positively impact critical thinking skills but not necessarily knowledge acquisition. Alternative, one would expect lecture-based instruction to positively impact knowledge acquisition but not necessarily critical thinking skills. Although one aim of the present study was to empirically validate this theory of problem-based learning and lecture-based instruction, a primary aim was to explore whether a hybrid of both approaches would lead to both better critical thinking skills and knowledge acquisition.

3. Methods

This study was conducted to directly compare the learning outcomes for a problem-based approach, a lecture-based approach, and a hybrid approach to teaching the same college course. Three different semester offerings of the same course, MGT 207 – Introduction to Human Resource Management, at Sacred Heart University, Fairfield, CT, were used to compare the three different pedagogical approaches. The courses were taught by the same faculty member, the present author, with the initial offering in the Fall of 2013 delivered using a traditional lecture-based approach, the second offering in the Spring of 2014 using a problem-based approach, and the third offering in the Fall of 2014 using a hybrid approach.

The lecture-based approach consisted of twice-weekly, hour and a half lectures. Learning was assessed using approximately bi-weekly quizzes to assess content learning, a mid-term and final essay exams to assess concept learning, and three writing assignments to assess concept learning and critical thinking. Additionally, a 50-question multiple-choice exam, with questions randomly pulled from the course textbook test bank, was administered as an assessment of knowledge acquisition. The multiple-choice exam was administered on the last day of class and was presented as a practice exam, not graded, but worth 5 extra credit points for any student willing to complete the exam.

The problem-based approach consisted of weekly, two and a half hour sessions which incorporated a typical problem-based delivery (see definition above). A set of learning objectives was presented to the class each week. An ill-defined problem associated with the learning objectives was presented on the Blackboard learning management system at the beginning of each week and then re-presented at the beginning of each class period. A set of resources that might be useful in approaching the problem was also presented on Blackboard the week of the class period. The students were divided into pre-

determined teams of 5 or 6, such that most students were on teams with other students they did not previous know. The students worked on the problem for the entire class period with the faculty member acting as facilitator. The faculty member would check on the progress of each team periodically, answer questions, ask questions aimed at guiding discover, and provide mini-lectures as needed. At the end of each class period the students would present their problem solution to the entire class. Learning was assessed using an evaluation of the quality of the solutions provided for each problem to assess content learning, concept learning, and critical thinking; a mid-term and final essay exam to assess concept learning; and three writing assignments to assess concept learning and critical thinking. Additionally, the same 50-question multiple-choice exam, with questions randomly pulled from the course textbook test bank, was administered as an assessment of knowledge acquisition. Again, the multiple-choice exam was administered on the last day of class and was presented as a practice exam, not graded, but worth 5 extra credit points for any student willing to complete the exam.

The hybrid approach was conducted in the same manner as the problem-based approach with two modifications. One, the two and a half hour sessions were divided in half such that the first half consisted of mini-lectures delivered by the instructor and the second half engaged the students to work on ill-defined, real-world problems. And, two, the ill-defined, real-world problems were shortened so that they could be completed in half the class period. All else remained the same.

For this particular research the writing assignments, the mid-term and final exams, and the 50-question multiple-choice exam were used to assess content learning and knowledge acquisition. And the writing assignments were used to assess critical thinking.

For the content learning, knowledge acquisition assessment, the writing assignments were graded by the faculty member teaching the course (the present author) by applying a rubric to each assignment focused on the inclusion and use of scholarly material, writing skill, the use of APA format, and description, explanation, synthesis, analysis, and evaluation of the topic presented in the writing assignment. The mid-term and final exams were graded by the faculty member teaching the course (the present author) and simply focused on the correctness and completeness of the answers provided by the students. Finally, to provide a more objective assessment of knowledge acquisition, the 50-question, multiple-choice exam was administered and automatically scored through the Blackboard learning management system.

For the critical thinking assessment, two, blind independent raters (both independent of each other and independent of the current author, and both blind to the nature of the study and pedagogical approach the students received) were given all writing assignments and assessed each by applying the Critical Thinking VALUE Rubric from the Association of American Colleges and Universities (https://www.aacu.org/value/rubrics/critical-thinking). The two independent raters' rubric values were correlated, as a measure of inter-rater reliability, and as they were only moderately correlated ($r = 0.39$) the individual rubric scores for the two raters were averaged.

All data was entered into SPSS software and analyzed using a series of mixed ANOVAs including both within and between subject factors.

4. Results

4.1. Demographics

A total of 76 students participated in this research. Eighteen of these students were enrolled and participated in the lecture-based offering of the course, 32 of these students were enrolled and participated in the problem-based offering of the course, and 26 of these students were enrolled and participated in the hybrid offering of this course. Thirty two of the students were seniors, 33 were juniors, 8 were sophomores, and 3 were freshman. The distribution of year in school across the three offerings of the course did not significantly differ (Chi Square $= 4.977$, $df = 6$, $p = 0.547$).

Thirty-eight of the students were female and 38 were male. However, there were more male students in the lecture-based offering and more female students in the hybrid offering (Chi Square $= 6.017$, $df = 2$, $p = 0.049$).

The mean grade point average (GPA) for students enrolled in these courses was 3.125 (on a 4 point scale) and did not significantly differ across the course offerings ($F = 0.293$, $df = 2$, $p = 0.747$).

4.2. Content learning, knowledge acquisition

With regards to content learning and knowledge acquisition the first analysis ran compared the course grades for the offerings and included year in school, gender, and GPA (re-coded as hi (above class average) or lo (below class average)). The ANOVA yielded a main effect for GPA ($F = 18.234$, $df = 1$, $p = 0.000$) with the students with higher than class average GPA receiving higher than average course grades compared to the students with lower than class average GPA. There were no other significant main effects or interaction effects.

The second analysis run compared the results of the multiple-choice practice exam for the offerings and included year in school, gender, and GPA (re-coded as above). The ANOVA yielded a course by year by GPA interaction effect ($F = 4.720$, $df = 1$, $p = 0.037$). Students in the problem-based offering showed a decline in knowledge acquisition from sophomore to senior year standing regardless of GPA. Students in the lecture-based offering showed an initial decline in knowledge acquisition from sophomore to junior year standing and then an increase to senior year standing, especially for the higher than average GPA students. Students in the hybrid offering with higher than average GPA showed the same pattern, though more knowledge acquisition overall (see Figs. 1 and 2).

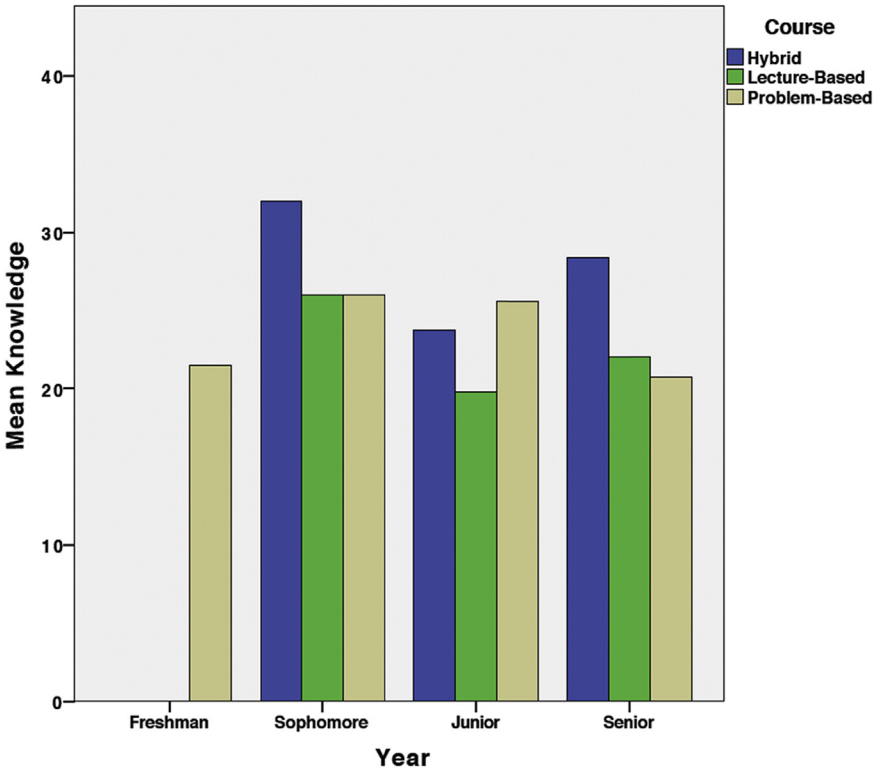

Fig. 1. Mean knowledge acquisition score for high GPA students.

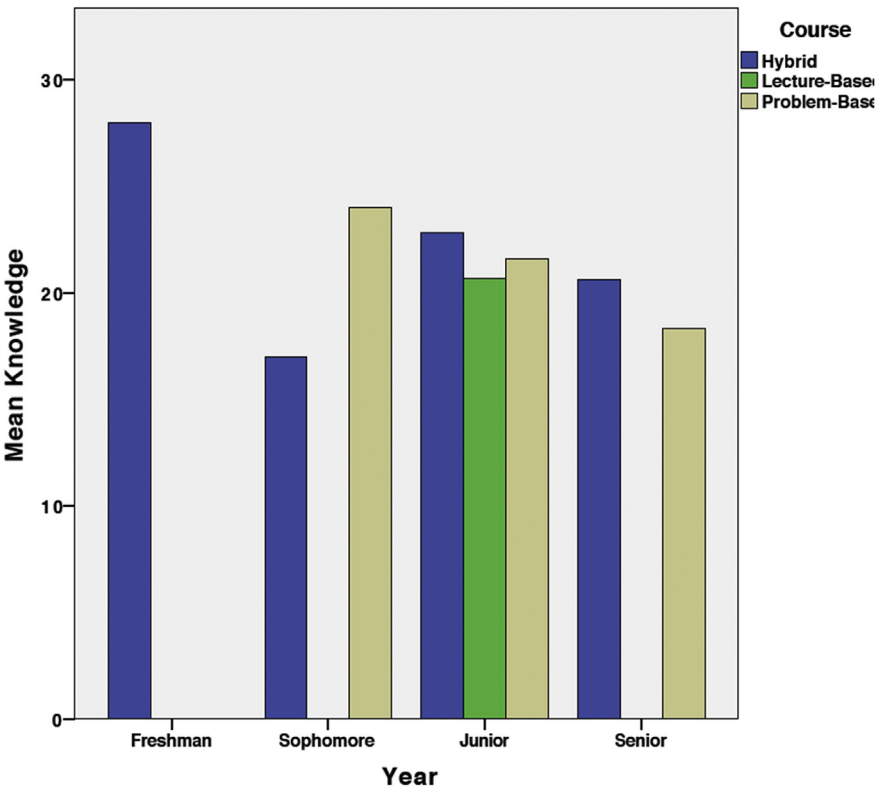

Fig. 2. Mean knowledge acquisition score for low GPA students.

The third analysis ran compared the students' exam grades (normalized as the mid-term and final exams were worth a differing number of points) for the offerings and included year in school, gender, and GPA (re-coded as above) as between subject variables and exam (mid-term and final) as a within subject variable. The ANOVA yielded a main effect for course offering ($F = 6.873$, $df = 2$, $p = 0.003$) with students in the lecture-based offering receiving higher exam scores (regardless of exam) than students in either the problem-based offering or the hybrid offering (see Fig. 3).

The ANOVA also yielded a main effect for exam ($F = 303.571$, $df = 1$, $p = 0.000$) and for GPA ($F = 6.873$, $df = 1$, $p = 0.00$). Finally, the ANOVA yielded an exam by gender interaction ($F = 5.046$, $df = 1$, $p = 0.030$) and an exam by GPA interaction ($F = 3.716$, $df = 1$, $p = 0.060$). There were no other significant main effects or interaction effects.

The final analysis ran compared the students' writing assignment grades for the offerings and included year in school, gender, and GPA (re-coded as above) as between subject variables and writing assignment (first, second, third) as a within subject variable. The ANOVA yielded a main effect for assignment ($F = 12.156$, $df = 2$, $p = 0.000$), for year in school ($F = 14.314$, $df = 3$, $p = 0.000$) and for GPA ($F = 13.468$, $df = 1$, $p = 0.001$). The ANOVA also yielded an assignment by year in school interaction ($F = 17.619$, $df = 6$, $p = 0.000$), an assignment by GPA interaction ($F = 3.605$, $df = 2$, $p = 0.038$), and an assignment by gender by GPA interaction ($F = 3.023$, $df = 2$, $p = 0.062$). There were no other significant main effects or interaction effects.

In summary, with regards to content learning and knowledge acquisition as learning outcomes, results here suggest that the lecture-based approach rather than the problem-based or hybrid approaches led to more content learning and knowledge acquisition when measured by exam grade. However, the hybrid approach led to more overall knowledge acquisition, particularly for students later in their academic careers, especially when they were good students (higher than average GPA), and when measured by a more objective, randomly generated multiple choice exam.

4.3. Critical thinking

With regards to critical thinking the analysis ran compared the Critical Thinking VALUE Rubric score on the writing assignments for the offerings and included year in school, gender, and GPA (re-coded as hi (above class average) or lo (below class average)) as between subject variables and writing assignment (first, second, third) as a within subject variable. The ANOVA yielded a main effect for course offering ($F = 3.692$, $df = 2$, $p = 0.036$) with students in the hybrid and problem-based offerings showing more critical thinking skill than those in the lecture-based offering (see Fig. 4).

The ANOVA also yielded a main effect for GPA ($F = 11.180$, $df = 1$, $p = 0.002$). Finally the ANOVA yielded a course by GPA interaction effect ($F = 3.736$, $df = 2$, $p = 0.035$) such that students with higher than average GPA showed more critical thinking regardless of course offering, but students with lower than average GPA showed more critical thinking in the hybrid offering (see Fig. 5).

The ANOVA also yielded a gender by year interaction ($F = 3.881$, $df = 2$, $p = 0.031$). And the ANOVA yielded a course by year by GPA interaction ($F = 4.997$, $df - 1$, $p = 0.033$) such that students in the hybrid and problem-based offerings showed overall

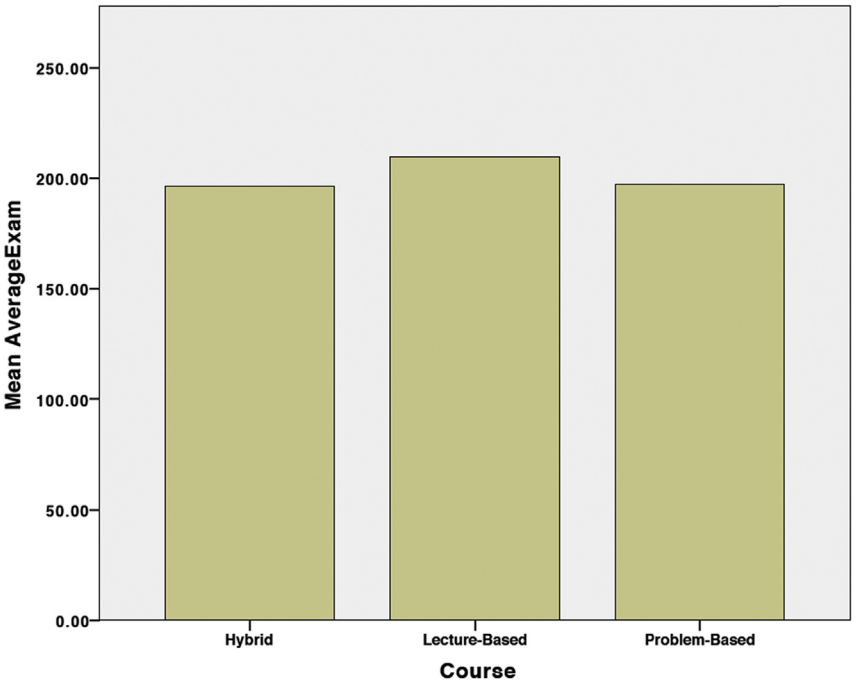

Fig. 3. Mean exam score (average of mid-term and final exam).

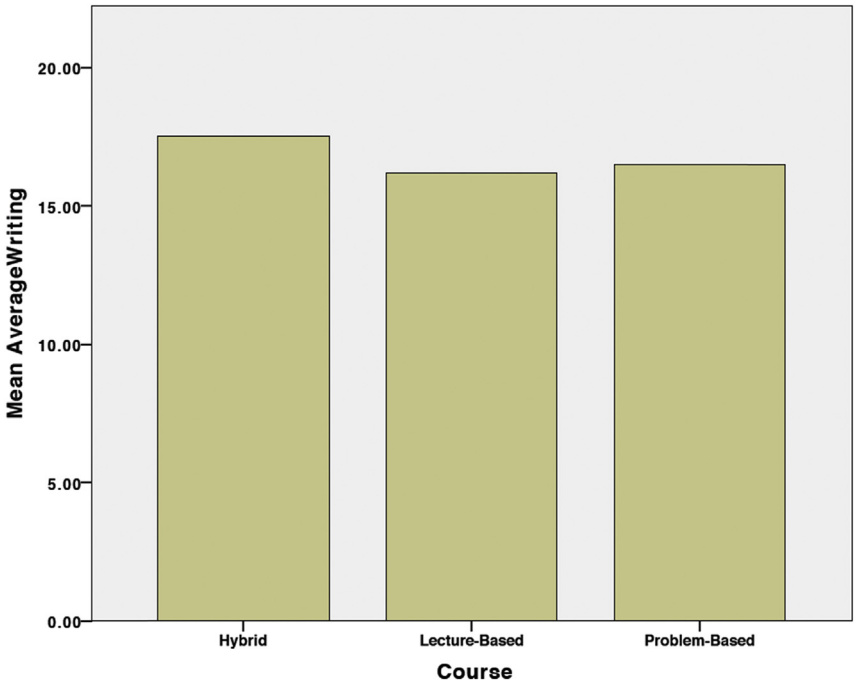

Fig. 4. Mean writing assignment critical thinking score (average of the three writing assignments).

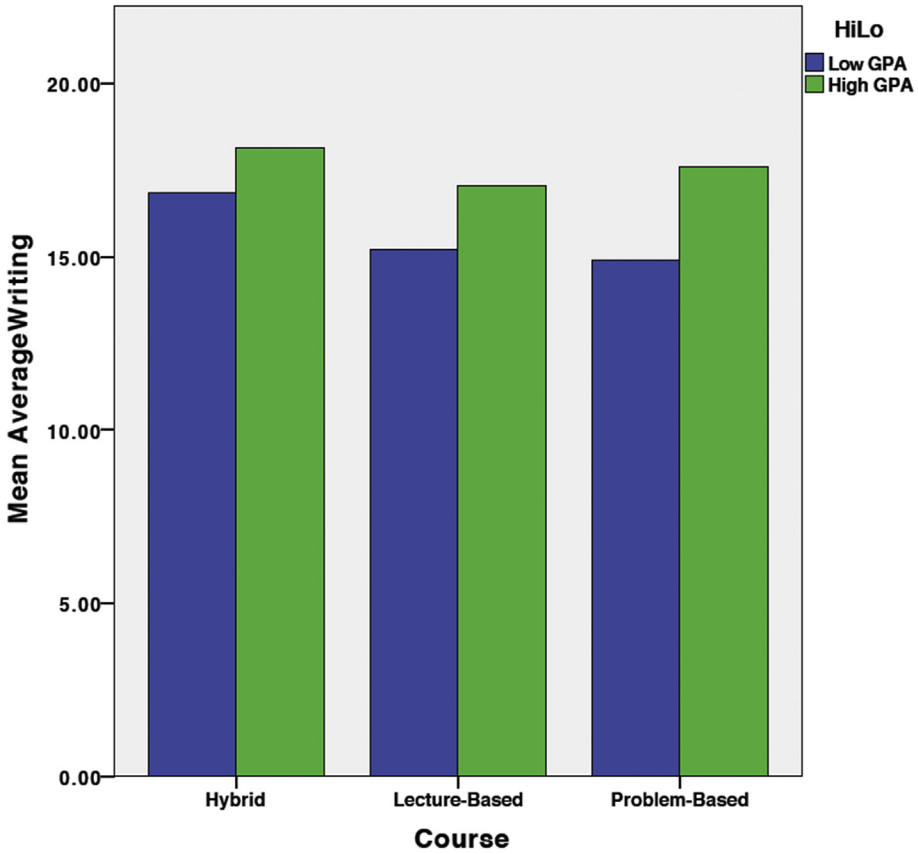

Fig. 5. Mean writing assignment critical thinking score (average of the three writing assignments) by GPA.

higher levels of critical thinking regardless of year in school, whereas students with lower than average GPA showed higher levels of critical thinking skills in the lecture-based offering only later in their academic careers (see Figs. 6 and 7).

There were no other significant main effects or interaction effects.

In summary, with regards to critical thinking as learning outcomes, results here show that the hybrid and problem-based approaches rather than the lecture-based approach promote more critical thinking skills. The hybrid approach particularly impacted the lower GPA students overall. But the lecture-based approach also impacted the lower GPA students, but only later in their academic careers.

5. Discussion

Somewhat similar to what was found in the application of problem-based learning within a medical school context (Albanese & Mitchell, 1993; Vernon & Blake, 1993; and Dochy et al., 2003), within a management classroom lecture-based instruction promotes more content learning and knowledge acquisition, whereas problem-based learning promotes more problem-solving and critical thinking skills. However, a hybrid of the two approaches, leveraging mini-lectures as well as ill-defined, real-world problems, led to more knowledge acquisition and critical thinking skills, particularly for students later in their academic careers (knowledge acquisition) and students with lower than average GPAs (critical thinking skills). Therefore, the hybrid approach would seem to be more effective overall at promoting learning than either a problem-based or lecture based approach singly.

Although the inclusion of other courses and other faculty in the present research design would be interesting, this may be a formidable task. Encouraging faculty to try out a new pedagogical approach for research purposes may be difficult. However, another very recent study (Garnjost & Lawter, 2015), using the same general subject population (students at Sacred Heart University in Fairfield, CT) in the same general timeframe (2014), considering the same general pedagogies (problem-based learning, lecture-based instruction, and project-based learning (analogous to the hybrid approach used in this study)), employed a quasi-field study surveying students in a wide variety of management courses taught by a variety of faculty in the same management curriculum, found that students' perceptions of their own learning outcomes were remarkably consistent with the objective assessment of learning outcomes in this report. Garnjost and Lawter (2015) found that students rated their own learning outcomes, in terms of knowledge acquisition, critical thinking, and problem solving, as significantly higher when presented with a project-based pedagogy (similar to the hybrid condition here) than either a problem-based or lecture-based approach. They found no other significant differences in self-reported learning outcomes among the three pedagogies. Therefore, whether assessed subjectively, using students self-report, or objectively, using assessment of learning outcomes, a

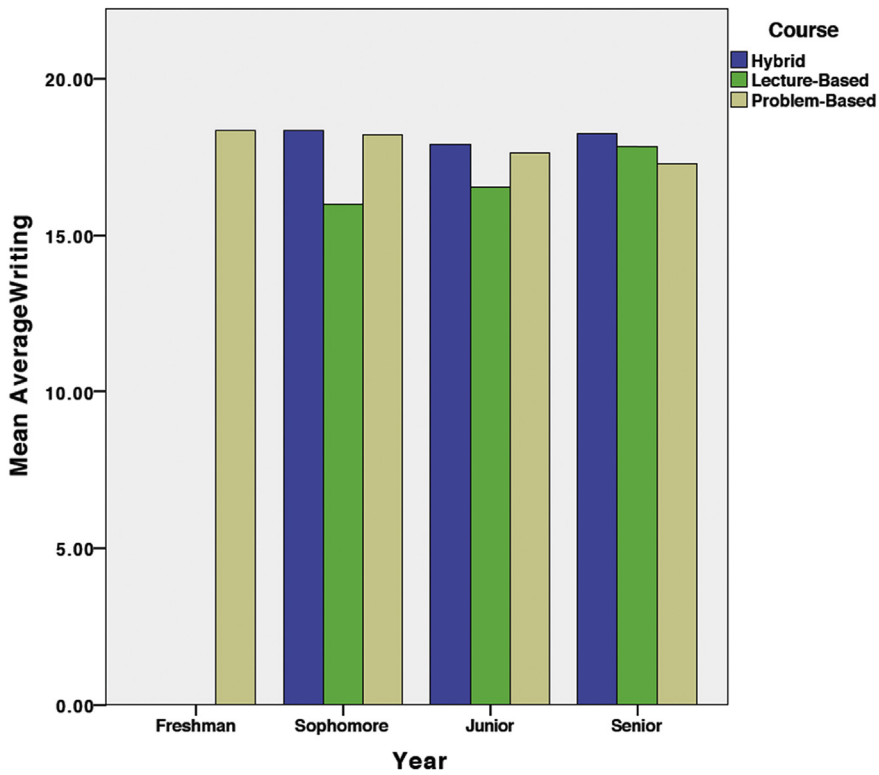

Fig. 6. Mean writing assignment critical thinking score (average of the three writing assignments) for high GPA students.

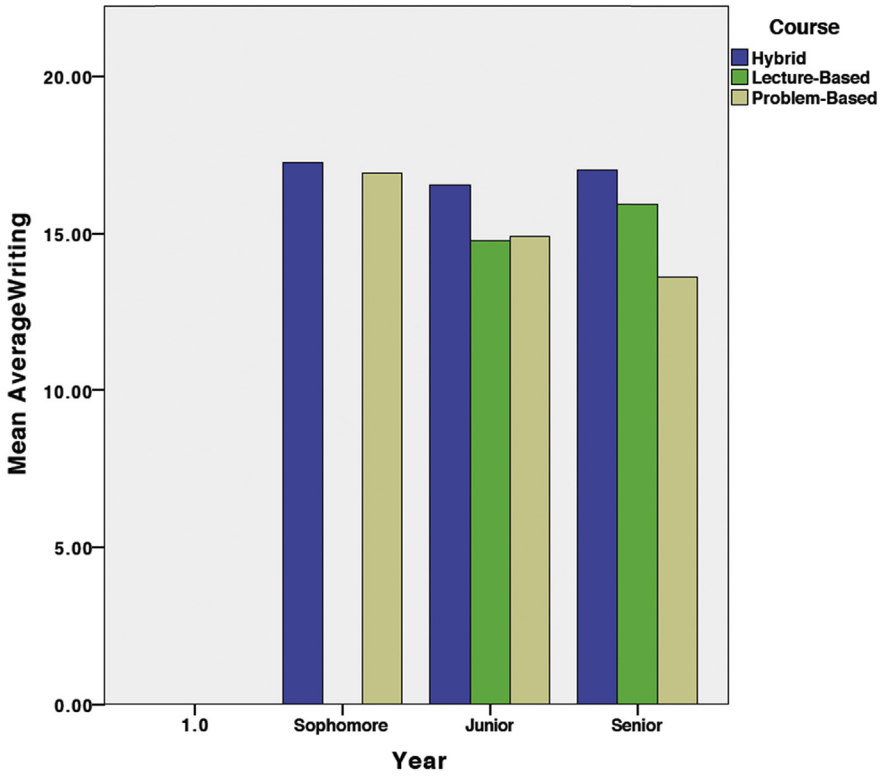

Fig. 7. Mean writing assignment critical thinking score (average of the three writing assignments) for low GPA students.

hybrid (or project-based) approach to management education leads to more knowledge acquisition and problem-solving skill than either a problem-based or lecture-based approach.

The results here may also indirectly lend support to what Savery (2006) noted … that the process of self-directed learning through problem-based learning must be integrated into the pedagogy of the curriculum and not just an add-on to an otherwise lecture-based curriculum. The MGT 207 class was one of the only classes within the undergraduate business curriculum leveraging some form of problem-based learning. Students seem to respond less positively to the problem-solving based aspects of a purely problem-based learning format when compared to a hybrid approach. Alternatively, students seem to respond less positively to the lecture based aspects of a purely lecture-based instruction format when compared to a hybrid approach. The lecture-based portion of the hybrid approach may have appealed to the students in terms of familiarity, it is what they are used to in the business curriculum. But interestingly, the problem based aspects, while being less familiar, may have only appealed within the context of the hybrid approach, in combination with mini lectures rather than as a standalone.

Perhaps the use of a hybrid approach is the best way to integrate problem-based learning into a management or business curriculum. Obviously, to wholly transform the curriculum to include the offering of every course in a problem-based learning way may be an ultimate goal. However, the evidence presented here, as well as the evidence from an assessment of student perceptions of learning outcomes (Garnjost & Lawter, 2015), and formerly in the medical school context, suggests that this may not be so as it would seem to only marginally impact problem-solving skills and not knowledge acquisition. An alternative way to integrate problem-based learning into a comprehensive curriculum might be to offer traditional, lecture-based introductory courses focused on knowledge acquisition gradually shifting to problem-based learning advanced courses focused on knowledge application. A further alternative might be to offer a traditional, lecture-based introductory course incorporating problem-based modules toward the end of the course as a means of promoting both knowledge acquisition and problem-solving skills. Mini-lectures on each weekly topic may be presented along with a specifically designed problem aimed at fostering problem-solving skills associated with the learning objectives for that week.

5.1. Limitations and future research

Potential avenues for future research might include the investigation of the impact of problem-based learning on other problem-solving skills. For example, Downing et al. (2011) looked at the impact of problem-based learning on the development of meta-cognitive skills, though in an engineering school context, but using a standardized measure of meta-cognitive skills.

Further, research might include alternative measures of learning outcomes. For example, Bamford et al. (2012) employed both a traditional, exam-based assessment of learning outcome and a novel, problem-based assessment of learning outcome in an operations management course. The problem-based assessment entailed presenting students with an ill-defined problem that they needed to respond to as a measure of what they had learned in the course.

Finally, research might consider other learning outcomes, other measures of problem-solving skill acquisition, other than critical thinking as assessed here using the Critical Thinking VALUE Rubric. For example, Hartman et al. (2013) assessed students' ability to tolerate ambiguity and coping skills as measures of problem solving in a problem-based delivery of an introductory business course.

One potential weakness of the present study that should be addressed in future research is that all the offerings of the course were taught by the same faculty member, who also knew the hypothesis tested here. Although the primary outcome measures may have mitigated this concern a bit. The assessment of knowledge acquisition was primarily through a randomly generated set of multiple-choice questions taken from the course textbook, test bank. And the assessment of critical thinking skills in the writing assignments was conducted by independent and blind raters who were blind to the course offerings of the students writing the papers and blind to the hypothesis of this research. Alternatively, having the same instructor teach all three offerings of the course decreased the likelihood that teaching and/or assessment style impacted the results found here. Additionally, as a review of the literature showed that there have been no other direct comparisons in learning outcome between a problem-based and lecture-based approach, yet alone a hybrid approach, in the management classroom, it would seem that these results make a valuable contribution to the literature on problem-based learning in the management classroom. Obviously, a replication of this study using multiple instructors, perhaps even with multiple levels of experience with problem-based learning, would seem warranted.

6. Conclusion

Is problem-based learning a better approach than traditional, lecture-based instruction in developing the future generations of managers and leaders? Based on the evidence here, and from medical schools, the answer would be a tentative “no”. Alternatively, the a more emphatic “yes” may be the answer if a hybrid approach, leverage mini-lectures (lecture-based approach) and ill-define, real-world problems (problem-based approach) were implemented.

References

Albanese, M., & Mitchell, S. (1993). Problem-based learning: a review of literature on its outcomes and implementation issues. *Academic Medicine, 68*(1), 52–81.

Bamford, D., Karjalainen, K., & Jenavs, E. (2012). An evaluation of problem-based assessment in teaching operations management. *International Journal of Operations & Production Management, 32*(12), 1493–1514.

Bigelow, J. D. (2004). Using problem-based learning to develop skills in solving unstructured problems. *Journal of Management Education, 28*(5), 591–609.

Brownell, J., & Jameson, D. A. (2004). Problem-based learning in graduate management education: an integrative model and interdisciplinary application. *Journal of Management Education, 28*(5), 558–577.

Carriger, M. (2015). Problem-based learning and management development: empirical and theoretical considerations. *International Journal of Management Education, 13*(3), 249–259.

DeFillippi, R., & Milter, R. G. (2009). Problem-based and project-based learning approaches: applying knowledge to authentic situations. In S. Armstrong, & C. Fukami (Eds.), *The SAGE handbook of management learning, education and development* (pp. 344–363). London: Sage Publications Ltd.

Dochy, F., Segers, M., Van den Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: a meta-analysis. *Learning and Instruction, 13*(5), 533–568.

Downing, K., Ning, F., & Shin, K. (2011). Impact of problem-based learning on student experience and meta-cognitive development. *Multicultural Education and Technology Journal, 5*(1), 55–69.

Garnjost, P., & Lawter, L. (2015). *What's wrong with lecture? Undergraduates' satisfaction vs. perception of learning outcomes of different teaching methods* (Manuscript in Preparation).

Hartman, K. B., Moberg, C. R., & Lambert, J. M. (2013). Effectiveness of problem-based learning in introductory business courses. *Journal of Instructional Pedagogies, 12*, 1–13.

Hmelo-Silver, C. E. (2004). Problem-based learning: what and how do students learn? *Educational Psychology Review, 16*(3), 235–266.

Hsieh, C., & Knight, L. (2008). Problem-based learning for engineering students: an evidence-based comparative study. *Journal of Academic Librarianship, 34*(1), 25–30.

Milne, M. J., & McConnell, P. J. (2001). Problem-based learning: a pedagogy for using case material in accounting education. *Accounting Education, 10*(1), 61–82.

Mitchell, J. E., Canavan, B., & Smith, J. (2010). Problem-based learning in communication systems: student perceptions and achievement. *IEEE Transactions on Education, 53*(4), 587–594.

Newman, M. J. (2005). Problem based learning: an introduction and overview of the key features of the approach. *Journal of Veterinary Medical Education, 32*(1), 12–20.

Peterson, T. O. (2004). So you're thinking of trying problem based learning? Three critical success factors for implementation. *Journal of Management Education, 28*(5), 630–647.

Savery, J. R. (2006). Overview of problem-based learning: definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 9–20.

Savery, J. R., & Duffy, T. M. (1995). Problem based learning: an instructional model and its constructivist framework. In B. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Sherwood, A. L. (2004). Problem-based learning in management education: a framework for designing context. *Journal of Management Education, 28*(5), 536–557.

Smith, G. F. (2005). Problem-based learning: can it improve managerial thinking? *Journal of Management Education, 29*(2), 357–378.

Stanley, T., & Marsden, S. (2012). Problem-based learning: does accounting education need it? *Journal of Accounting Education, 30*, 267–289.

Stinson, J. E., & Milter, R. G. (1996). Problem-based learning in business education: curriculum design and implementation issues. In R. J. Menges (Ed.), *New directions for teaching and learning* (pp. 33–42). Hoboken, NJ: Wiley.

Vernon, D. T. A., & Blake, R. L. (1993). Does problem-based learning work? A meta-analysis of evaluation research. *Academic Medicine, 68*(7), 550–563.