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The Effects of Standardizing Student Presentations in Problem Based Learning on Overall Student Satisfaction

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Abstract:

Problem based learning (PBL) is an education model designed to teach students new content and skills by encouraging them to work cooperatively with peers through complex problems and questions. The PBL model is based on adult learning theory and designed to stimulate challenge acceptance and learning curiosity among students.^v The purpose of our study was to evaluate if enforcing standards for presentations during PBL sessions improved students' perceived efficacy and value of the course. Nine, first-year medical students from the University of California-San Diego School of Medicine were selected to participate in the study. Data was collected via student surveys before and after implementing and enforcing specific requirements for student presentations. Questions on the surveys were designed to assess the effects of new student presentation guidelines on students' perceptions of their own presentations' value/efficacy, students' perceptions on their classmates' presentations' value/efficacy, and students' perceptions on the overall value of PBL sessions. Comparison of pre- and post-intervention survey results showed significant improvement on two questions assessing student perceptions of their own presentation quality. While the data from this study was relatively inconclusive, the results were confounded by the project's small sample size. Despite the small sample size, there is some evidence that enforcing standard guidelines for PBL presentations does improve students' perceptions of their own presentations' efficacy and value. Further research on student presentations should be pursued to better evaluate this finding and possibly improve problem-based learning curricula.

Introduction:

Problem based learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to a complex questions, problems, or challenges. The goals of PBL are to

help the students develop flexible knowledge, effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation.ⁱ

Initially created by medical school faculty at McMaster University in the late 1960s, complete or hybrid PBL curricula are now used at a significant number of medical universities around the world. By 2012, 80% of U.S. medical schools incorporated at least some PBL into their pre-clinical curriculum.ⁱⁱ PBL has come to be favored at many institutions over more traditional, lecture-driven models due to its student-centered approach that focuses on real life, clinical problem solving.ⁱⁱⁱ While, some educational researchers site that problem centered learning promotes the development of clinical reasoning skills, content retention, and long term physician competency,^{iv,v} other evidence suggests that PBL may be no more effective than more traditional, lecture based curricula.^{vi} However, in one randomized control trial comparing outcomes in a basic pharmacology course, students who completed the course using a PBL model performed equally, if not slightly better, than students receiving a traditional, lecture based curriculum. More importantly, students subjectively favored the experimental PBL model over the more traditional, lecture-based format.^{vii}

Although the early designers devised an educational philosophy and student centered-approach that would hopefully supplant more traditional models, current PBL falls into two distinct classes of curricula: Pure and Hybrid.^{viii} While a pure PBL curriculum completely replaces lecture with small group case studies, student centered learning, and clinical problem solving/discussions, hybrid curricula use PBL tutorials to supplement their more traditional lecture-based curriculum.^{ix} By 2003, hybrid curricula were much more common than pure curricula amongst U.S. medical schools using a PBL design, with some individuals considering pure models as almost non-existent.^x

In their review of modern PBL practices, Davis and Harden suggest that PBL curricula become 'a continuum of approaches rather than one immutable process', and 'a teaching method that can be included in the teacher's tool-kit along with other teaching methods rather than used as the sole educational strategy.'^{xi} Taylor and Mifflin further elaborate that PBL has strayed from the structure originally

envisioned by its creator, Howard Barrows, at McMaster University.^{xiii} Taylor and Miflin argue that this variation in structure/design across medical universities, stemming from the wide dissemination of Barrow's original concept, resulted in the unclear efficacy of PBL. They suggest that standardizing PBL curricula as originally designed by Barrows would increase the curriculum's overall efficacy and prove its superiority over more traditional models.

This project is designed to determine if, as outlined by Taylor and Miflin, improving PBL session standardization increases course efficacy. Specifically, we are interested in determining if re-enforcing course standards for student presentations improves student's perceptions of the efficacy of these presentations and the value of weekly PBL sessions.

Methods:

- Context: The University of California-San Diego School of Medicine uses an organ-based approach during the pre-clinical training (years 1 and 2). First year students complete eleven 2-5 week blocks comprised of lectures, anatomy labs, histology labs, and small group sessions centered around specific organ systems (ie. Pulmonary, Cardiac, Renal, etc). At the end of each block, students complete a 60 question, multiple-choice, pass-fail exam comprising pertinent material covered during class sessions. This organ-based approach utilizes a hybrid PBL model to add clinical relevancy and promote student-centered learning during the pre-clinical training. At the beginning of each quarter, students are divided into PBL groups of 8-10 students. Students attend biweekly PBL cases that, while often centered on diagnoses not previously covered in lecture, are designed to coincide with the organ system that students are covering in their current block. On the first day of each case, students work together to discuss pertinent information, create a differential diagnosis, identify knowledge gaps, and determine pertinent research topics intended to fill in said gaps. Between day 1 and 2 of each case, students research a given look-up topic and create presentations designed to teach their classmates this new material. On the second day of each case, students share their presentations and use the new information to further discuss the patient and confirm a diagnosis.

While material covered during PBL cases is not assessed on block exams, students receive both a pass/fail grade and formal feedback for this course and the end of each quarter.

- Participants: Participants were 9 first year medical students (5 men and 4 women) at the University of California-San Diego School of Medicine. All participants of this study were members of a single, randomly chosen, first year PBL group. Each student was randomly assigned to this group prior to the initiation of the study. Each participant was in good academic standing at the time of this project.

- Intervention: The project was declared as IRB exempt by the University of California-San Diego IRB Office prior to the study's commencement. This project took place during the 4-week, first year, renal block (Jan 2016). During the first 2 weeks of this study, the PBL group functioned without any interventions. At the end of these two weeks, each student completed a 12-question survey designed to assess their perceptions of their own PBL presentations, their classmates' presentations, and the overall efficacy of biweekly PBL sessions (Appendix 1). Each question on the survey was evaluated using a 5-point Likert Scale. All identifying information was removed from surveys to ensure anonymity throughout the entirety of the project. At the beginning of week 3, students received a handout outlining specific student presentation expectations/guidelines covered in the formal, UCSD Problem Based Learning Course Curriculum. This handout outlined guidelines for student presentations, gave the educational theory behind each guideline, described the clinical relevance of following each guideline, and provided specific examples of how students could follow each guideline in their presentations (Appendix 2). The examples for following each guideline were pulled directly from past second year med students' PBL presentations. None of the examples given on this handout were from cases the students completed during the study period. Prior to this project, students had never been given a formal handout outlining these specific presentation requirements. Students were required to follow these specific presentation requirements during PBL presentations for the remainder of the renal

block. At the end of the 4-week project, students completed the same survey they were given at the end of week 2.

- Data Analysis: Data from the week 2 and week 4 surveys was analyzed using statistical software. We used paired sample T tests to compare the mean pre- and post-intervention scores for each survey question to assess whether or not emphasizing standardized presentation guidelines improved the perceived efficacy/quality of student presentations and value of weekly sessions' value.

Results:

The pre and post-intervention score comparison revealed significant improvement ($p\text{-value} < .05$) in the post-intervention scores questions 1 and 4. Two other questions, questions 2 and 5, demonstrated nearly significant improvement ($.05 < P < .10$) on post-intervention surveys (Table 1). No other questions demonstrated a significant difference between the mean pre- and post-intervention survey results.

Discussion:

In this study, we attempted to improve PBL sessions by explaining and enforcing previously designed requirements for weekly student presentations. Statistically significant results were obtained when comparing the mean pre- and post- intervention responses for two specific survey questions. These two survey questions both assessed how students perceived the efficacy of their own presentations at teaching new clinical content to classmates. It is possible that implementing a strict, 3-minute time limit helped students narrow their presentation content to only the most pertinent information, thus helping them to create more succinct, and therefore more effective, presentations. It is also possible that requiring presenters to use visual aids, incorporate student activity, and eliminate pre-written scripts created more engaging presentations that helped students better convey material to their classmates. In any case, using this handout

appeared to not only help illustrate course expectations for student presentations, but also to provide students with specific examples of how to incorporate these requirements into their presentations.

This project was performed within one 9 student, first year PBL group. The project was initiated at the beginning of winter quarter when students are placed into new PBL groups. Therefore, the participants had never worked with one another prior to the initiation of this study. Students' experiences over the 4-week study may have been confounded by working with new classmates. Students often become more engaged in PBL as they form a supportive environment between themselves, their group mates, and their facilitator. Negative feelings expressed on pre and/or post-intervention surveys may be more related to students' experiences working in a group that had not yet established a supportive environment than to their actual opinions about the PBL curriculum.

Similarly, due to scheduling constrictions, this study had to be run within one month (2 weeks pre-intervention and 2 weeks post-intervention). Therefore, students only had two weeks to adjust to a new set of presentation guidelines they had not been required to follow during the first 15 weeks of med school (first quarter of their MS1 year). Had the students been given more time to implement these new guidelines before completing post-intervention surveys, we may have seen a greater difference between pre and post-intervention results.

We initially thought that standardizing student presentations was a good target intervention because the results of our study would be less affected by how a faculty facilitator managed/led the group. We thought creating a student-centered intervention would best help us control for confounding variables that would affect the overall reliability of our data. However, it is possible that first year medical students already felt positively about the student presentation component of their PBL curriculum. This already positive opinion would make it less likely that our intervention, which in the students' eyes, possibly altered an already good thing, would have a positive impact on student perceptions of student presentations, or the overall PBL course. Similarly, data collected by the UCSD School of Medicine Administration from previous classes suggests that students generally have a very

favorable opinion about PBL. Since our subjects' baseline opinion about PBL was likely also pretty high, it may have been difficult to get a statistically significant improvement on post-intervention survey results. It would have been interesting to include an additional section on the post-intervention surveys where students could provide subjective feedback about whether or not they found the handout helpful for producing higher quality presentations. While this intervention would have eliminated the standardization between our pre- and post-intervention surveys, it would also have provided valuable feedback for future study designs or PBL curriculum interventions.

Although many of the post-intervention survey responses showed improved mean values when compared to pre-intervention responses, the overall significance of this improvement was limited by the small sample size. It is possible that increasing the study's sample size would have yielded more significant improvement between pre and post-intervention surveys. Similarly, It is also possible that the group facilitator impacted the effects of our intervention. This particular group of students was led by a veteran PBL facilitator who had previously been acknowledged by course administrators for his excellent PBL leadership. Since the group was so well led during the first two weeks of our study, it was likely more difficult to see a significant improvement between pre- and post-intervention surveys. Had our experimental group been less effectively led during the 2-week, pre-intervention period, it may have been easier to see the positive effects of our intervention on student presentations.

Although the study yielded some significant results, there are several changes that should be made to future PBL studies. This particular study should be repeated with a larger sample size to better evaluate how enforcing standardized presentation guidelines affects students' opinions about the efficacy of their and their classmates' presentations, as well as the overall value of PBL sessions. It is also possible that our particular intervention wasn't optimal for improving student PBL presentations. Perhaps tweaking the presentation guidelines (ie. a longer presentation time limit) or devoting additional class time to teaching presentation skills would more significantly improve student perceptions of presentation and

overall course efficacy. Finally, we should re-evaluate our pre- and post-intervention surveys to determine if we chose the best questions to assess student opinions about PBL.

The study could also be repeated using multiple, previously established PBL groups to eliminate possible confounders related to intragroup and facilitator dynamics. It would also be interesting to repeat the study on second year students to evaluate if more experienced medical students respond differently to the implementation of new, presentation requirements.

As problem-based learning becomes a more universal component of medical school curricula, it is important to research PBL session structure and execution to further improve the course's efficacy.

Table 1: Comparison of Pre and Post-Intervention Results Across All Survey Questions

Survey Question Number	Test Statistic	P-Value
1	2.29	0.05*
2	1.83	0.10**
3	0.56	0.59
4	2.29	0.05*
5	2.00	0.08**
6	1.51	0.17
7	0.00	1.00
8	1.51	0.17
9	0.43	0.69
10	0.80	0.45
11	0.36	0.73
12	0.56	0.59

Table 3: Table outlining the comparisons between pre and post-intervention survey data for each of the 12 questions assessed on the student surveys.

** Indicates significant P-values ($P < .05$).*

***Indicates weakly significant P-values ($P < .10$)*

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