

# UC San Diego

## Independent Study Projects

### Title

Improvement in USMLE scores at one institution after curriculum change to an integrated scientific curriculum.

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Improvement in USMLE scores at one institution after curriculum change to an integrated scientific curriculum.

## **INTRODUCTION:**

Medical schools for years have been shifting the preclinical curriculum away from a traditional, subject-based presentation of material in favor of innovative approaches. It is widely held among educators that increasing student engagement results in improved mastery of basic principles and early exposure to clinical reasoning<sup>1</sup>. An increasingly popular option among US medical schools has been to incorporate problem-based learning as a vehicle to stimulate active, student-initiated learning<sup>2</sup>. Although the term “problem-based learning” has been used in many different contexts, central to its definition is that concrete problems provide the anchor for learning<sup>3</sup>. In the context of medical education the “problem” is frequently a biomedically-oriented clinical vignette. This stem is presented to a small group of students who are overseen by a tutor who facilitates the group. After some discussion the students generate questions pertaining to the case that are necessary to achieve mastery of the subject matter. The questions are divided among the group members, researched, and presented to the group at a later session. Coincident with this trend has been curriculum re-organization designed to present information “vertically” in the context of relevant organ-systems rather than by discipline and to change traditional grading systems to pass/fail only. Outcomes from such interventions have been hard to quantify on a large-scale basis.

Numerous institutions have reported enhanced outcomes after changing curriculum<sup>4</sup>; however, the evidence remains unclear. Several multifactorial analyses evaluating curriculum alongside student-specific variables have concluded that most of the variation in performance data is between students rather than between schools or with regard to any institution-specific variables<sup>5-7</sup>. That is, student performance is mostly predicted by individual factors that can be assessed prior to acceptance to any medical school. In these analyses, the few instances where curriculum type was found to contribute significantly to standardized test performance were

sporadic, and a clear trend could not be established. One large meta-analysis of 116 medical schools found that curriculum accounted for less than 1% of the total variance in a model predicting standardized test scores when evaluated alongside medical school GPA, MCAT, and age.<sup>6</sup>

Central to these studies are scores from Step 1 of the US Medical Licensing Exam (USMLE), a standardized exam administered nationally and required for allopathic physician licensure. It covers material from the preclinical curriculum of medical education (the first two years at UCSD). It is a metric that has traditionally been used to gauge mastery of the preclinical curriculum, and is a key component of the residency selection process<sup>8</sup>.

UCSD School of Medicine underwent a complete curriculum change starting with entering year 2010. As part of the new curriculum, the school instituted a systems-based approach called the integrated scientific curriculum (ISC)<sup>9</sup>. The ISC has substantial small group activities, uses PBL extensively, and makes use of a “vertical” presentation of material. The grade of “honors” was completely removed from the preclinical curriculum in favor of true “pass-fail” grading. With an emphasis on mastering only essential material and reducing extraneous lectures, the ISC has less instruction in both lecture hours per day and number of weeks in class. This framework allowed several improvements over the previous curriculum. Dedicated USMLE Step I study time was increased from 5 to 6 weeks (with students free to schedule the exam anytime within that period). A one-week comprehensive, case-based basic science review was also added at the end of the second year prior to the dedicated study time. The first class to undertake the new curriculum took Step I earlier this year. This analysis reports effects of this intervention on USMLE scores when matched to MCAT scores.

## **METHODS:**

Project was approved as institution review exempt through the UCSD Human Research Protections Program Office. USMLE scores matched to MCAT were obtained from the office for

Undergraduate Medical Education for the entering classes of 2009 and 2010 (240 students total). Students who entered under the combined BS/MD program did not have MCAT scores available, and were excluded (18 excluded). Additionally students with the top and bottom 5% of USMLE scores within each class were excluded per the IRB protocol to ensure anonymity of individuals with outlier scores leaving 203 total students for the final analysis, 103 students from the entering class 2009, and 100 students from the entering class 2010.

All statistical tests were done with Microsoft Excel Professional Plus 2010. A multiple regression was performed using MCAT and curriculum as independent variables and USMLE Step I score as the dependent variable. An unpaired t-test was done comparing MCAT scores for both classes and a separate unpaired t-test comparing USMLE scores.

## **RESULTS:**

Independent linear regressions for USMLE score by MCAT revealed Pearson Coefficients of 0.48 (entering class of 2009) and 0.41 (entering class of 2010), consistent with other values reported in the literature<sup>10</sup>. See figure 1.

An unpaired t-test for MCAT showed a nonsignificant ( $p=.63$ ) difference in entering score, but a change in USMLE of 6.6 points with the new curriculum ( $p<.01$ ). See table 1. Multiple regression showed significance for both MCAT score ( $p<.01$ ) and curriculum ( $p<.01$ ) as predictors of USMLE score with a cumulative Pearson Coefficient of  $r=0.50$ .

## **DISCUSSION**

USMLE Step I scores at our institution were raised by an average of 6.6 points with the intervention of a new curriculum when controlling for MCAT score. This was far above the national increase of 1 point over the same time as reflected by USMLE score reports. There were several simultaneous interventions within the new curriculum, but the underlying assumption that the student populations between the two entering classes are homogenous should remain valid considering that admission criteria did not change between the two years. Furthermore, the entering cumulative undergraduate GPA was identical for both classes (3.76).

As multiple interventions were made, most of which with good evidence to back them, the effect is likely multifactorial—but almost certainly curricular—in nature. The possibility of a “pioneer” effect exists wherein there is something special or unique about the first set of students to go through the new system.

Some students reported feeling uncertainty and unease, and that there was a general perception that they needed to spend more time with self-directed learning to ensure that they achieved a thorough review of all material before approaching the test. With respect to the interventions at our institution, pass/fail grading has been found to significantly contribute to increased student well-being while preserving USMLE step scores, but alone does not seem to improve USMLE test performance.<sup>11,12</sup> Additional Step I study time, of which the new students were allowed an additional week, has been evaluated in other contexts and has not been a significant contributor to score increases<sup>13</sup>.

The amount of additional motivation provided by being the first class through is unclear as there were already external motivators in place prior to the intervention. Indeed, USMLE Step I is arguably the most important test in a physician’s career, and a key determinant in residency selection<sup>8</sup>. If there were an effect, the magnitude of such a change should be borne out by further evaluating with a larger cohort, e.g., including several years from both before and after the curriculum change.

The fact that prior research has reported such an array of outcomes is concerning that our success may not be applicable outside our institution, or that success with such reforms relies on several variables being simultaneously manipulated. That the UCSD School of Medicine’s carefully planned overhaul of the curriculum was capable of increasing student learning as measured by standardized test scores is encouraging. Theoretically student satisfaction should be improved as well with the implementation of pass-fail grading and reduced lecture hours. Further research is necessary to determine whether student satisfaction has changed and whether this initial change is borne out over time.

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**TABLES & FIGURES**

**Table 1: Summary Data**

	<b>2009</b>	<b>2010</b>	<b>Significance</b>
MCAT	33.2	33.5	$p=0.63$
USMLE	230.6	237.2	$p<.01$

**Figure 1: Linear Regression for matriculating years 2009 and 2010**

