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## Evaluation of Student Performance Using Multiple Choice and Open-Ended Examination Questions in a Pharmacy Calculations Course.

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## **Disciplines**

Pharmacy and Pharmaceutical Sciences

## **Comments**

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# Evaluation of Student Performance Using Multiple Choice and Open-Ended Examination Questions in a Pharmacy Calculations Course

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## Objective

To evaluate student performance in courses, instructors have used various types of question item formats in their examinations. The objective of this study was to compare the performance of pharmacy students completing a Pharmacy Calculations course which employed either open-ended or multiple choice examination questions.

## Methods

A required Pharmacy Calculations course was taught to first year pharmacy students in two sequential years. The course content was essentially identical in both offerings.

Year 1: four examinations using open-ended questions were administered to the students (n=75) with partial credit awarded. Year 2: four multiple-choice examinations, employing no means for partial credit were administered (n=78).

The averages for each examination and overall course average for the two offerings were compared using a one-way ANOVA. Both courses were also assessed through an on-line course evaluation system using E-Value.

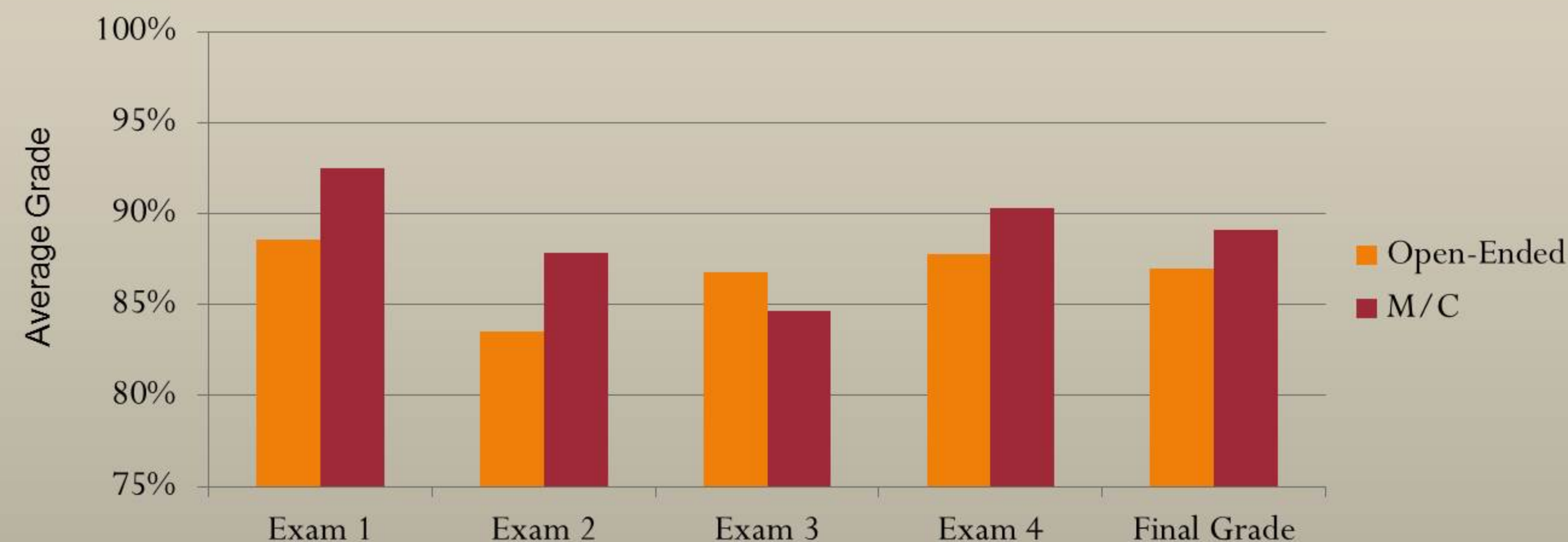
## Course/Exam Parameters

	# of students	Exam format	Partial Credit	Bonus Questions
Year 1	75	Open-Ended	Yes	Yes
Year 2	78	Multiple Choice	No	Yes

## Class Exam and Overall Grades (Average (%) +/- Std Dev)

	Exam 1	Exam 2	Exam 3	Exam 4	Overall
Year 1 (Open-Ended)	88.65 +/- 7.21	83.57 +/- 9.15	86.84 +/- 8.57	87.89 +/- 6.95	86.97 +/- 6.08
Year 2 (Multiple Choice)	92.47 +/- 7.73*	87.81 +/- 10.95*	84.67 +/- 11.50	90.29 +/- 7.28*	89.11 +/- 6.89*

\* Indicates a statistical difference (P<0.05)



## Results

Over a two year period, 153 students completed the Pharmacy Calculations course and course evaluation. One student failed the course in each year. In year 1, the class average (86.97 +/- 6.08) was significantly (P<0.05) lower than year 2 (89.11 +/- 6.89), implying that there may be some advantage to students who were offered multiple choice exams. Even with partial credit allotted to open-ended question formats, no apparent advantage is noted.

## Student Evaluations (score out of 7)

	Year 1	Year 2
The assignments/projects/papers helped my understanding of course content.	6.12	6.31
My grades accurately reflect my performance in this class	4.89	5.86
I learned a lot of valuable information in this course.	5.99	6.37
I am able to properly interpret medical abbreviations associated with a prescription or medication order.	6.36	6.67
I know and am able to use mathematical pharmacy conversions within and between units of measure.	6.32	6.63
I am able to perform calculations necessary to successfully compound a prescription or medication order.	6.08	6.44
I am able to perform calculations necessary for the appropriate dosing or dispensing of medications.	6.22	6.54

## Conclusions and Implications

The use of multiple choice exams over open-ended exams in Pharmacy Calculations courses may provide students some added advantage in examinations. Course instructors might consider a combination of formats when assessing student knowledge.

## Reference

<http://www.statext.com/download.htm> accessed on July 5, 2011.