

General Information

- The Pharmacy Curriculum Outcomes Assessment[®] (PCOA[®]) was administered to a total of 1,735 students enrolled in 15 pharmacy curricula across the United States in spring 2009. Of this total, 108 students were from nontraditional, distance learning programs. All tables and figures included in this document are based on the 1,627 students that were enrolled in traditional programs.
- Table 1 illustrates the number of students participating across the professional program years along with the total number within each designated region of the United States.

Table 1 – Number of Examinees by Year and Region

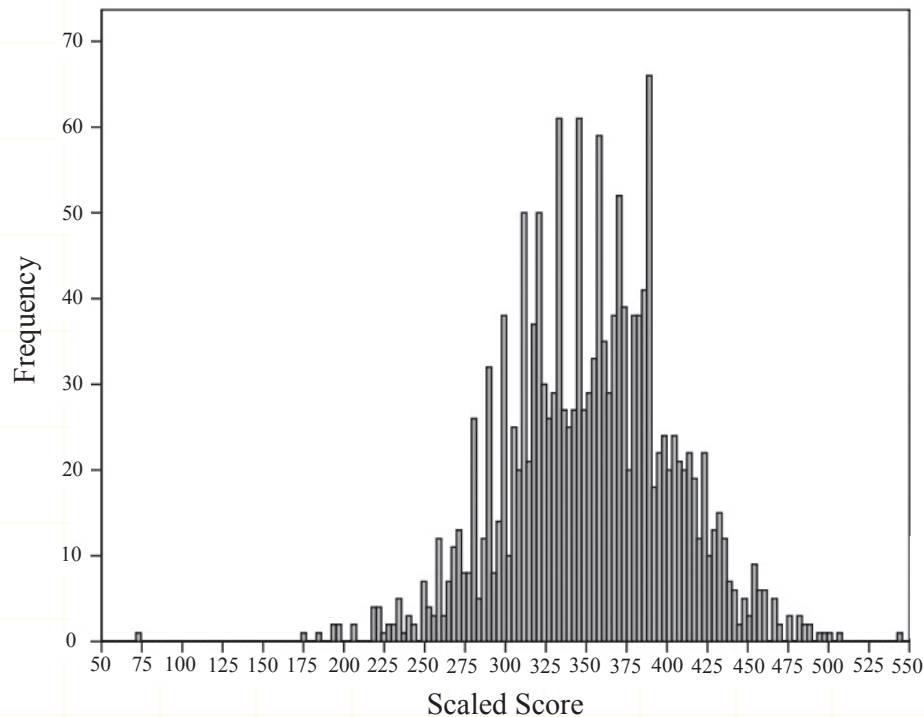
		Year 1	Year 2	Year 3	Year 4	Total
REGION	Midwest	76	85	315	29	505
	Northeast	68	0	303	0	371
	South	197	183	181	3	564
	West	46	50	43	48	187
TOTAL		387	318	842	80	1,627

Examination Summary

Figure 1 is a histogram of the scaled score distribution for the entire set of students participating in the 2009 PCOA administration.

- On average, the typical examinee answered approximately 60% of the items correct.

Figure 1 – 2009 PCOA Scaled Scores



Mean = 352.73
 Std. Dev. = 50.91
 N = 1,627

Item Analyses of Content Areas

Table 2 reports the descriptive statistics for the item difficulties on the content areas, where a higher mean difficulty indicates a more challenging area.

- There were minor differences in average item difficulty between content areas (content area scaled item difficulties were anchored/equated to the total examination item difficulties).
- On average, Pharmaceutical Sciences was the most challenging content area.

Table 2 – Difficulty Level for the Content Areas
(Using Scaled Item Difficulties)

CONTENT AREA	Mean Difficulty (scaled)	Std. Dev.	Model Std. Error	Std. Error of Mean	Min.	Max.
Basic Biomedical Sciences	292	92	5.9	14.2	74	509
Pharmaceutical Sciences	319	76	5.5	10.1	132	460
Social/Behavioral/Administrative Pharmacy Sciences	238	96	6.5	17.3	90	436
Clinical Sciences	295	97	5.9	11.6	75	471

Reliability and Validity Evidence

Reliability

Table 3 reports the internal reliability coefficient (Cronbach’s alpha for the raw scores) for 2007, 2008, and 2009.

- The reliability indices are very similar across all three years and the coefficients are very high for the total assessments.

Table 3 – Internal Reliability Coefficient for the Total Assessment

TOTAL ASSESSMENT			
Year	2007	2008	2009
Cronbach’s Alpha	.90	.91	.90
Number of Scored Items	200	199	200

Validity

Table 4 displays the inter-scale correlation between the content areas.

- Inter-scale correlations showed a commonality (measurement of pharmacy curriculum knowledge) between content areas, but that each area is also unique to a certain extent.
- The Clinical Sciences and Pharmaceutical Sciences content areas were observed to be the most highly correlated among the four content areas.

- The 2007, 2008, and 2009 PCOA administrations aligned extremely well with the examination's blueprint, which is evidence of content-related validity.
- Exploring the fit of the data (ie, high scorers get more difficult items right than low scorers do), the assessment appears to be working as a measure of pharmacy curriculum knowledge.

**Table 4 – Correlations Between the Content Areas
Inter-Scale Correlations (N=1627)**

		Basic Biomedical	Pharmaceutical	Social/ Behavioral/ Administrative Pharmacy	Clinical
Basic Biomedical Sciences	Pearson Correlations	1	–	–	–
	Sig. (2-tailed)	–	–	–	–
Pharmaceutical Sciences	Pearson Correlations	.587	1	–	–
	Sig. (2-tailed)	.000	–	–	–
Social/Behavioral/Administrative Pharmacy Sciences	Pearson Correlations	.473	.506	1	–
	Sig. (2-tailed)	.000	.0000	–	–
Clinical Sciences	Pearson Correlations	.507	.677	.580	1
	Sig. (2-tailed)	.000	.000	.000	–

Table 5 reports the students' scale scores by program year for the 2009 PCOA data.

- The 2009 PCOA data demonstrates an increase in knowledge across the professional years (program year 4 students have more knowledge than program year 1 students).
- The assessment is behaving as expected by showing knowledge growth over the years in the pharmacy programs.
- For the Total Exam and for each of the four major content areas, there was a significant increase (LSD, $p < .05$) in scale scores between most of the program years. Exceptions were in Basic Biomedical Sciences content area between years two and three, where the scores decreased, and in Social/Behavioral/Administrative Pharmacy Sciences content area between years two and three, where the scores increased but not significantly.
- Table 5 presents mean scaled scores per year of study.

Table 5 – National Scale Score Means by Program Year

SCALE SCORES	Year 1	Year 2	Year 3	Year 4
Total Exam	313	354	366	394
Basic Biomedical Sciences	345	363	358	375
Pharmaceutical Sciences	303	356	364	381
Social/Behavioral/Administrative Pharmacy Sciences	332	360	366	404
Clinical Sciences	298	349	378	422

Psychometric Summary

All of the preceding evidence demonstrated that there is high level of confidence in the reliability and validity of the assessment, in its scores and in its inferences about the abilities of students. The evidence shows that the PCOA supports:

- A standard psychometric examination scoring procedure, including the piloting of new items, a key validation item analysis, subject-matter expert review of flagged items, final analysis, user-friendly scaling, and content area analysis with anchoring
- Reporting of participating school region demographics
- Reporting of total examination and content area statistics
- Cronbach's alpha reliability indices, which show that the total assessment and the content areas consistently and reliably measure pharmacy knowledge and skills
- The reliability index shows that the items measure a single dimensional construct
- The direct and precise linkage of the current PCOA content to its stated blueprint
- Exploration of the goodness-of-fit confirmed that the assessment scale supports construct validity
- Inter-scale correlation study that showed that there is much commonality between the content areas, but that each content area also brings some of its own uniqueness to the assessment
- Demonstration that the assessment behaves as expected as evidenced by examining the increase in pharmacy knowledge from program year 1 to program year 4 and between the program years
- Exploration of knowledge growth in the content areas and differences between the content areas over the years
- Exploration of overall knowledge growth through each student's change scores



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