

Using Test Blueprints and Item Analysis to Improve Multiple Choice Exams

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Concerns

- Ignorance (what do law professors really know about multiple choice tests?)
- How reliable are my tests?
- Are my tests well correlated learning outcomes? Are they consistent with the course content/lectures/objectives?
- Are my students succeeding?

Strategy

- Use test blueprints and item analysis to:
 - Improve assessments (ask better questions that are consistent with learning outcomes and objectives)
 - Improve assessment and test analysis processes
 - Gather historical data

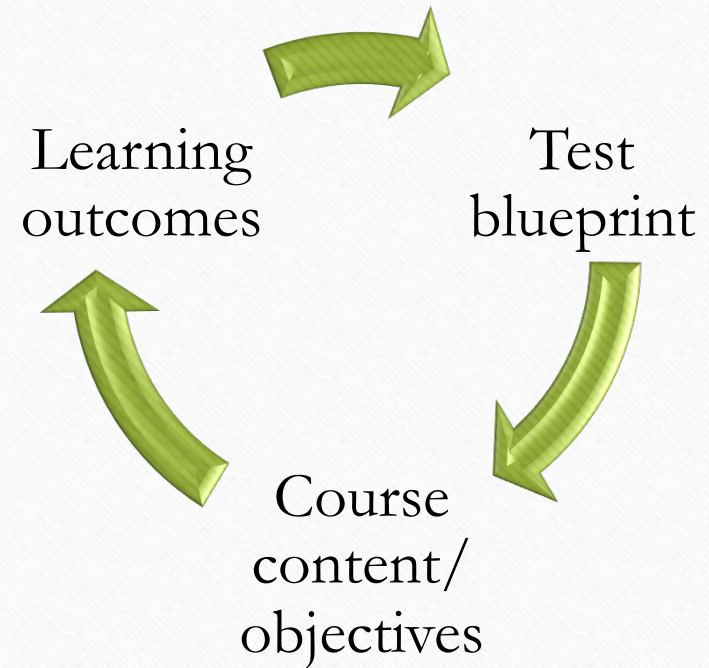
Take home messages

- Every faculty needs a Director of Assessment
- Improved and appropriate tests cannot be built in a day
- Plan, assess, analyze, revise, integrate, then do same over and over again
- Get on board the eClass train now!

The blueprint

- Bloom's Taxonomy

- Knowledge
- Comprehension
- Application
- Analysis
- Evaluation
- Synthesis



	#	Knowledge	Comprehension	Application	Analysis	Evaluate	Synthesis
Introduction to Ethics	1						
Beneficence and nonmaleficence	2						
Autonomy/ informed consent	4						
Conscientious objection	1						
ACP Code of Ethics/Professional Discipline	1						
Introduction to the Legal System	3						
Privacy Law	5						
Law of Negligence	6						
CDG/Safety and handling of adverse events	2						
Substance Abuse by Pharmacists	2						
Law of Abuse	3						

Example?

Mohammed, a janitor at Rexall Pharmacy, overheard Ms. Duke asking the pharmacist for medication to treat a rash. He subsequently wrote on his Facebook page: “Ms. D has a rash.” This disclosure is:

- a. Legally appropriate because the information disclosed is non-identifying information
- b. Legally appropriate because M is not a health information custodian
- c. Legally appropriate because the information disclosed is not drug information
- d. Legally inappropriate because the disclosure is not permitted by law

Evaluation?

- Knowledge: of the law (Health Information Act)
- Comprehension: ability to interpret terms/principles in the HIA (“custodian”, “affiliate”, “identifying information”, “non-identifying information”, etc.)
- Application: ability to use/apply learned material to new/concrete fact pattern
- Analysis: What is the legal effect of M’s action on D? What are the consequences? Does it matter that M is a janitor?
- *Evaluation?* Are the legal consequences/conclusions identified in the test options logical (in a factual, ordinary, moral or ethical sense?)

The analysis

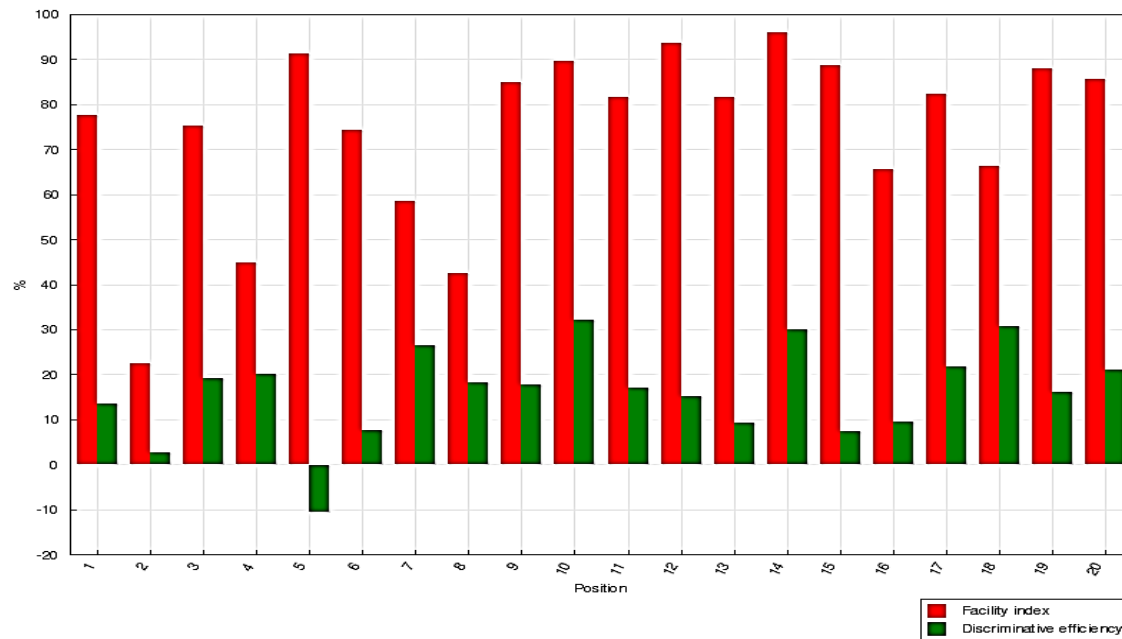
Quiz name	PHARM 362 (PHARMACY LAW AND ETHICS): MIDTERM EXAMS (2014) - Requires Respondus LockDown Browser
Course name	PHARM 362 PHARMACY LAWS AND ETHICS (LEC A1 Fa14)
Open the quiz	Monday, 17 November 2014, 1:00 PM
Close the quiz	Monday, 17 November 2014, 3:00 PM
Open for	2 hours
Number of complete graded first attempts	127
Total number of complete graded attempts	127
Average grade of first attempts	67%
Average grade of all attempts	67%
Average grade of last attempts	67%
Average grade of highest graded attempts	67%
Median grade (for highest graded attempt)	65%
Standard deviation (for highest graded attempt)	12%
Score distribution skewness (for highest graded attempt)	-0.29
Score distribution kurtosis (for highest graded attempt)	-0.28
Coefficient of internal consistency (for highest graded attempt)	40%
Error ratio (for highest graded attempt)	78%
Standard error (for highest graded attempt)	9%

The analysis

Q#	Question name	Attempts	Facility index	Standard deviation	Random guess score	Intended weight	Effective weight	Discrimination index	Discriminative efficiency
1	1. In Alberta, ethical rules governing pharmacy practice are primarily ...	125	77.60%	41.86%	25.00%	5.00%	5.30%	10.28%	13.54%
2	2. Your employer has implemented a policy that prevents disclosure of adverse...	125	22.40%	41.86%	25.00%	5.00%	4.47%	1.71%	2.55%
3	3. Kanjit runs a pharmacy in Crestwood, Edmonton. He believes every client ...	125	75.20%	43.36%	25.00%	5.00%	5.81%	14.47%	19.05%
4	4. Crocker, a pharmacist working in an Edmonton drugstore, dispensed a ...	125	44.80%	49.93%	25.00%	5.00%	6.58%	15.60%	20.17%
5	5. Li is a pharmacist in the town of Corner Gas, Saskatchewan. As a catholic,...	125	91.20%	28.44%	25.00%	5.00%	2.04%	-6.41%	-10.40%
6	6. Your client has refused medication that would be beneficial to her. It is ...	125	74.40%	43.82%	25.00%	5.00%	5.11%	6.00%	7.65%
7	1. A pharmacist who signs a Professional Undertaking Agreement is protected ...	125	58.40%	49.49%	25.00%	5.00%	6.94%	20.70%	26.47%
8	2. Akeem, a pharmacist and the owner of a community pharmacy in Millwoods, ...	125	42.40%	49.62%	25.00%	5.00%	6.44%	14.18%	18.27%
9	1. Married pharmacists Miley and Robin Cyrus-Thicke have been arrested by the...	125	84.80%	36.05%	25.00%	5.00%	4.88%	12.39%	17.72%
10	2. The Alberta Court of Appeal is the source of:	125	89.60%	30.65%	25.00%	5.00%	4.93%	20.76%	32.21%
11	3. The Charter of Rights and Freedoms is best classified as:	125	81.60%	38.90%	25.00%	5.00%	5.18%	12.44%	16.91%
12	4. The final court of appeal for cases originating from the Alberta ...	125	93.60%	24.57%	25.00%	5.00%	3.34%	8.50%	15.22%
13	1. Pierre, a 15-year old Montreal resident, can consent alone to:	125	81.60%	38.90%	25.00%	5.00%	4.66%	6.64%	9.12%
14	1. This type of information should NOT be communicated to a patient during ...	125	96.00%	19.67%	25.00%	5.00%	3.25%	14.28%	30.02%
15	2. A custodian is permitted to disclose non-identifying health information:	125	88.80%	31.66%	25.00%	5.00%	3.75%	4.86%	7.38%
16	2. Akosua, a pharmacist at the University of Alberta hospital, mistakenly ...	125	65.60%	47.70%	25.00%	5.00%	5.65%	7.55%	9.41%
17	3. A patient who is refused access to his or her medical records can:	125	82.40%	38.24%	25.00%	5.00%	5.35%	15.38%	21.66%
18	4. Health information disclosed to pharmacists who work in privately-owned ...	125	66.40%	47.42%	25.00%	5.00%	6.99%	24.49%	30.67%
19	5. Mohammed, a janitor at Rexall Pharmacy, overheard Ms. Daisy Duke asking ...	125	88.00%	32.63%	25.00%	5.00%	4.36%	10.54%	16.04%
20	6. Amina, a chronic pain sufferer, is married to Dmitri, a pharmacy at ...	125	85.60%	35.25%	25.00%	5.00%	4.97%	14.59%	21.05%

The analysis

Statistics for question positions



The analysis

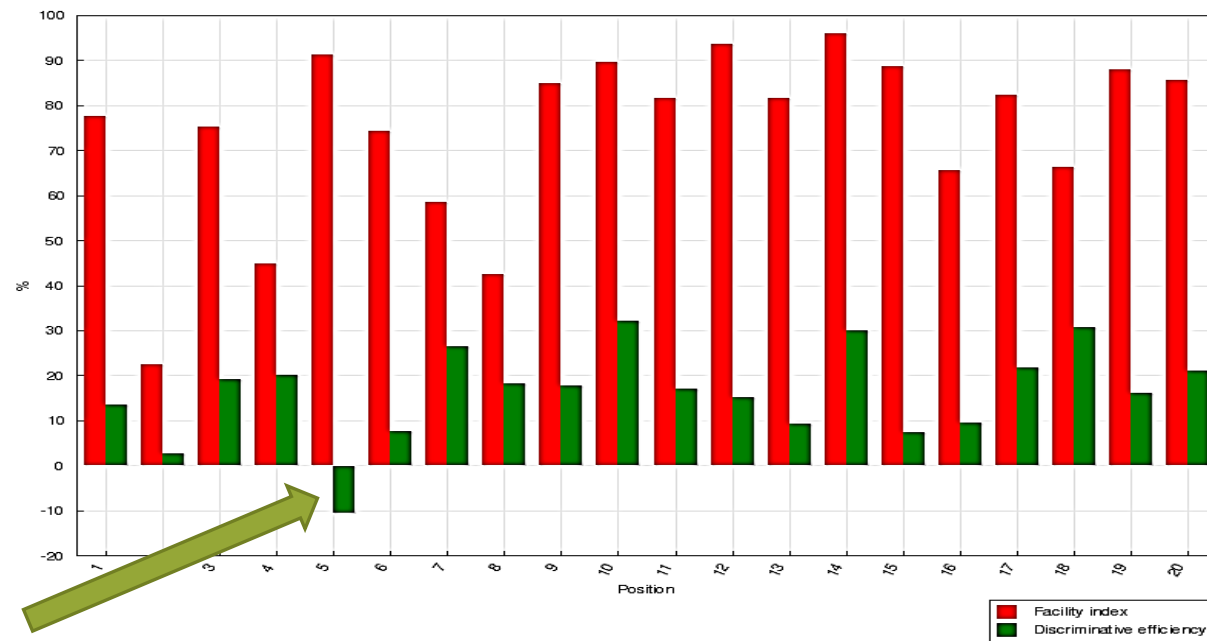
- **Facility (difficulty) index:** average score on each question – a higher FI indicates question is easier for test takers
- **Discrimination index:** how well is the question correlated with the rest of the test
 - If well correlated (hence a good question), high performing students should score highly on the question
 - If index is low or negative, then low performing students did better on the question
- **Cronbach's alpha (KR-20):** one measure of test reliability / internal consistency – higher values indicate better reliability / consistency / correlation

Mohammed *v* Duke

- Facility index: 88%
- Discrimination index: 10.54
 - a. 4
 - b. 11
 - c. 0
 - d. 110
- Issues
 - Options a & c did not achieve intended purpose
 - Move option b to d? (“Janitor” effect)
 - Option d too general
 - Emphasize “affiliate” responsibilities during class?

One more example

Statistics for question positions



Why?

- Too easy, obviously
- No student chose option a; only 1 chose option c
- Options b and d too similar? (High performing students chose b because did not read d?)

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Acknowledgments

- Dr. Ken Cor, Director of Assessment, Faculty of Pharmacy and Pharmaceutical Sciences & Associate Director, Assessment, CTL
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