

Aligning Therapeutics Course Objectives and Assessments for Content and Cognitive Levels

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Problem

Concerns:

- Does assessment help to develop instructional goals and promote high quality higher education, including pharmacy school education?
- Too often, assessment information is used for accreditation requirements and then filed away afterward, and not used to improve education (Provesis & Jankowski, 2012).
- Critical and higher order thinking has been identified as an important goal of pharmacy education, but we do not know if it is being taught and assessed (Cisneros, 2009).

Purpose

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- To determine if pharmacy education in NL is meeting the educational outcomes of the Association of Faculties of Pharmacies of Canada (AFPC).
- To analyze the objectives and assessment items of two therapeutics courses to determine if they are aligned for (a) subject area content, and (b) cognitive levels of thinking.
- To determine if critical and higher order thinking is being taught and assessed in these two pharmacy courses.

Role of assessment in learning

- Assessments should be aligned with course objectives so the objectives and assessments work together to support student learning.
- **Alignment:** “the degree to which expectations and assessments are in agreement and serve in conjunction with one another to guide the system toward students learning what is expected.” (Webb, NL, 2002)
- Course objectives set the expectations for students, and if objectives and assessments are aligned, then students have the opportunity to learn and meet the expectations of the program.

Anderson & Krathwohl (2001): 6 Cognitive Processes

Lower order thinking:

1. Remember—Retrieve relevant knowledge from long-term memory
2. Understand—Construct meaning from instructional messages, including oral, written, and graphic communication

Higher order thinking:

3. Apply—Carry out or use a procedure in a given situation
4. Analyze—Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose
5. Evaluate—Make judgments based on criteria
6. Create—Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure

Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., et al. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Longman.

Lower order thinking verbs

Remember (A & K, 2001)

Recognize: Identify Recall: Retrieve

Arrange, cite, define, duplicate, enumerate, identify, label, list, name, match, recall, recognize, repeat, restate, reproduce, select, state (UNC, Marzano & Kendall)

Ex. **"Know the Code of Ethics and Discipline for pharmacists"**

Understand (A&K)

Interpret: Clarify, paraphrase, represent, translate

Exemplify: Illustrate, instantiate

Classify: Categorize, subsume

Summarize: Abstract, generalize

Infer: Conclude, extrapolate, interpolate, predict

Compare: Contrast, map, match

Explain: Construct models

Abstract, categorize, chart, clarify, classify, compare, conclude, contrast, convert, depict, describe, diagram, discuss, distinguish, draw, estimate, exemplify, explain, extrapolate, generalize, give examples, illustrate, infer, instantiate, interpolate, interpret, map, match, paraphrase, predict, represent, review, show, subsume, summarize, symbolize, translate

Ex. **"Demonstrate understanding of professionalism in pharmacy practice through being able to orally generalize, interpret, and exemplify this concept"**

Higher order thinking verbs

Apply (A & K)

Execute: Carry out Implement: Use

Act, administer, chart, compute, construct, demonstrate, develop, employ, establish, participate, predict, prepare, produce, project, provide, show, sketch, solve, utilize, draft, complete, locate, make

Ex. **“Implement individualized care plans which include prescription-ready medication recommendations, ordering lab tests for monitoring drug therapy, and providing patient-tailored education”**

Analyze (A&K)

Differentiate: Discriminate, distinguish, focus, select

Organize: Find coherence, integrate, outline, parse, structure

Attribute: Deconstruct

Break down, correlate, diagram, prioritize

Ex. **“Interpret findings of relevant laboratory data, physical assessments, and history for the identification and resolution of DRPs”**

Higher order thinking verbs

Evaluate (A & K)

Check: Coordinate, detect, monitor, test Critique: Judge

Appraise, argue, assess, conclude, confront, criticize, decide, defend, rate

Ex. **“Evaluate the efficacy and safety of the care plan and recommend necessary changes to therapy”**

Create (A & K)

Generate: Hypothesize

Plan: Design

Produce: Construct

Anticipate, propose, compose, devise, formulate, individualize, initiate, integrate, problem solve, experiment, test, research, investigate, develop

Ex. **Develop a care plan by prioritizing a patient’s DRPs, establishing goals of therapy, assessing alternatives, recommending therapeutic options, and determining monitoring parameters**

Method

1. Observed 37 therapeutics classes over two semesters.
2. Determined the cognitive level of each course objective and assessment item.
3. Determined the course objectives that each assessment item was assessing.
4. Determined if course objectives and assessment items matched for content and cognitive level.
5. Determined the content and cognitive levels of lecture objectives.
6. Held focus groups with 12 students from the therapeutics courses to get their thoughts about the types of thinking they used when answering assessment questions and their thoughts about the assessments generally.
 - 6 female, 6 male; 22 to 29 years of age; 5 first degree, 6 undergraduate degrees, 1 Master of Bioscience; first therapeutics course – 84 average

Data and analysis

Data:

- 31 course objectives
- 175-200 lecture objectives
- 416 assessment items
- Notes from 37 lectures
- 305 minutes of audio recording
- 65 pages of focus group transcription

Analysis:

- Descriptive statistics - frequency distributions
- Classical content analysis - first cycle coding (structural and holistic), second cycle coding (pattern)

Alignment for content of AFPC outcomes and course objectives in Phar 4401 and 4402 combined with exam questions

AFPC outcome	Number of course objectives	Number of exam questions
Care Provider	13	210
Communicator	8	0
Collaborator	2	0
Manager	0	0
Advocate	3	0
Professional	3	0
Scholar	2	49 ^a
No AFPC outcome directly	0	192 ^b
Total	31	416

^a 35 of these questions assessed outcomes from both care provider and scholar. There were 11 questions that assessed scholar only.

^b These questions aligned for content with lecture objectives, all of which were directly related to care provider or scholar AFPC outcomes.

Numbers of exams and types of questions in Phar 4401

Exam	Number of questions	MC questions	Short answer questions	Higher order questions	Higher order MC questions	Higher order short answer questions	Lower order questions
1	16	4	12	10 (62.5%)	1	9	6
2	18	0	18	11 (61.1%)	0	11	7
3	10	0	10	8 (80.0%)	0	8	2
4	26	2	24	11 (42.3%)	1	10	15
5	30	29	1	16 (53.3%)	15	1	14
6	37	30	7	13 (8.1%)	8	5	24
7	38	25	13	1 (2.6%)	1	0	37
8	26	26	0	6 (23.0%)	6	0	20
Total	201	77	124	76 (37.8%)	32	44	125

Numbers of exams and types of questions in Phar 4402

Exam	Number of questions	MC questions	Short answer questions	Higher order questions	Higher order MC questions	Higher order short answer questions	Lower order questions
1	36	30	6	7 (19.4%)	2	5	29
2	56	43	13	26 (46.4%)	15	11	30
3	58	50	8	7 (12.1%)	1	6	51
4	65	53	12	23 (35.4%)	15	8	42
Total	215	176	39	63 (29.3%)	33	30	152

Alignment for cognitive levels of course objectives in Phar 4401 and 4402 combined with exam questions

Cognitive levels	Number of questions at each cognitive level	Number of questions that match cognitive levels of course objectives	Number of questions that are above cognitive level of objective	Number of questions that are below cognitive level of objective	Number of questions with no course objective, but had lecture objectives
Remember	264	0	0	78	186
Understand	10	4	0	5	1
Apply	119	63	1	53	2
Analyze/Evaluate/Create	23	23	0	0	0
Total	416	90	1	136	189

Themes from focus groups

1. Some students (9/12) used lecture objectives when studying for assessments, no students used course objectives or AFPC outcomes.

“pretty much when I’m finished studying I’ll go through the lecture objectives to see if I can recall it on my own”

“personally I never, ever look at objectives, not before or after”

Themes from focus groups

2. Students think the short answer questions reflect the lecture objectives, but not necessarily the MC questions.

“I find most of the long answer are based on them, but the MC could range, could be vaguely. It seems like it could be almost anything from the lecture on MC, not just what is highlighted in the learning objectives”

“certain profs stray from the lecture objectives more than others with their questions” (all agreed)

Themes from focus groups

3. Students prefer questions that require them to apply the important concepts they have been taught rather than questions that focus on relatively minor details.

“if it`s not important enough to put in the 15 pages of notes you gave us, why is it important to test (they all laughed), if it is really important, put it in the notes, too”

“Dr. X does a good job in her lectures in really hammering home what she thinks are important points, and then her questions really reflect that”

Themes from focus groups

4. Students prefer exam questions that are similar to examples they have experienced in class.

“the questions on the exam are not a surprise, they are like the ones we do in class”

“he covered the topics in class (others agreed), but it was different from the cases we went over in class”

Themes from focus groups

5. Students thought that many of the short answer questions required them to think at a higher level and apply what they were learning in therapeutics, but many of the MC were recall items, and not always recall of important concepts.

“I think, sometimes, rather than testing the understanding of the material and knowing the drug therapy that goes with that and the side effects that go with that, for some MC they tend to take the most obscure points, they might not be applicable to anything”

“the short answer do test your higher knowledge of it, so like if you are actually able to apply what you learned, which is one of the learning objectives that we’re supposed to be able to apply this to a real life situation”

Themes from focus groups

6. Students would like to know the expectations and/or criteria for strong and acceptable responses to questions and feedback on how to improve responses after they complete exams.

“in the class with Dr. X where he talked about goals of therapy was the only time we have ever received feedback (remembers talking about it with another classmate) on an exam, and it was really helpful”

“this kind of gave us a base line of how to answer therapeutic questions on our exams but also how to apply it clinically, what is therapeutics about if it is not about how to be a good pharmacist and make strong clinical decisions, concise, that’s the key there, and he showed us how to do that, I thought that was probably the best therapeutics class we’ve ever had, to be quite honest”

Implications

1. **Modify course objectives** so they:

- communicate what is important for the students to learn.
- align with assessments for content and cognitive levels.
- align with lecture objectives.
- include only those objectives which the instructors intend to teach and assess.

Implications

2. **Revise assessments** so they:

- align with the course objectives for content and cognitive level.
- decrease the number of questions at the Remember level.
- include more questions at the Understand level.
- include more higher order questions, where applicable.
- **Model** the types of questions on the assessments in classroom practice.

Implications

3. Use some of the **tutorials** to:

- clarify the expectations and criteria for strong and acceptable responses to questions.
- provide feedback on how to improve responses after exams are completed.

Implications

4. The students sometimes identified differently how they thought when they were answering questions from what the instructors intended when they wrote the questions on the assessments.

Plan:

- a) Interview sample of professors to determine what cognitive level of thinking they intended for questions.
- b) Match this with how students say they thought when they answered the questions.
- c) Modify questions, where necessary.

Implications

5. This study/approach can be used with other pharmacy courses to **improve student learning**, and to **improve instruction and assessment**.