

Building a better exam: Using educational theory to standardize assessment construction and review processes

Kimberly Daugherty, PharmD, PhD, BCPS
kdaugherty@sullivan.edu

Sarah Raake, PharmD, MEd, BCACP, LDE
sraake@sullivan.edu

Ben Stephens, M.Ed.
bstephens@sullivan.edu

Objectives

- Discuss the differences between faculty trainings based on constructivism vs. cognitivism.
- Describe workflow best practices to streamline assessment creation and create uniformity using past student performance
- Explain job aids and additional supports provided to faculty
- Provide data on changes in creation time, blueprint consistency, exam performance, and post-item adjustments before and after initiation of the workflow

About us: Sullivan University College of Pharmacy & Health Sciences

- Private institution in Louisville, KY
- COPHS contains 2-year Master's level Physician Assistant program and 3-year Doctor of Pharmacy (PharmD) program
- Year-round, quarter-based system
- No large assessment office
- Limited checks-and-balances system within assessment creation/review process
- Faculty and course coordination self-sufficiency is a must

How it started....

Constructivism states...

”Teaching and learning, especially for adults, is a process of negotiation, involving the construction an exchange of personally relevant and viable meanings”

(italics in original)

(Candy, 1991, as cited in Merriam et al., 2007, p. 293).

Generous Interpretation:
Communities of Practice

Less Generous Interpretation:
Wild West

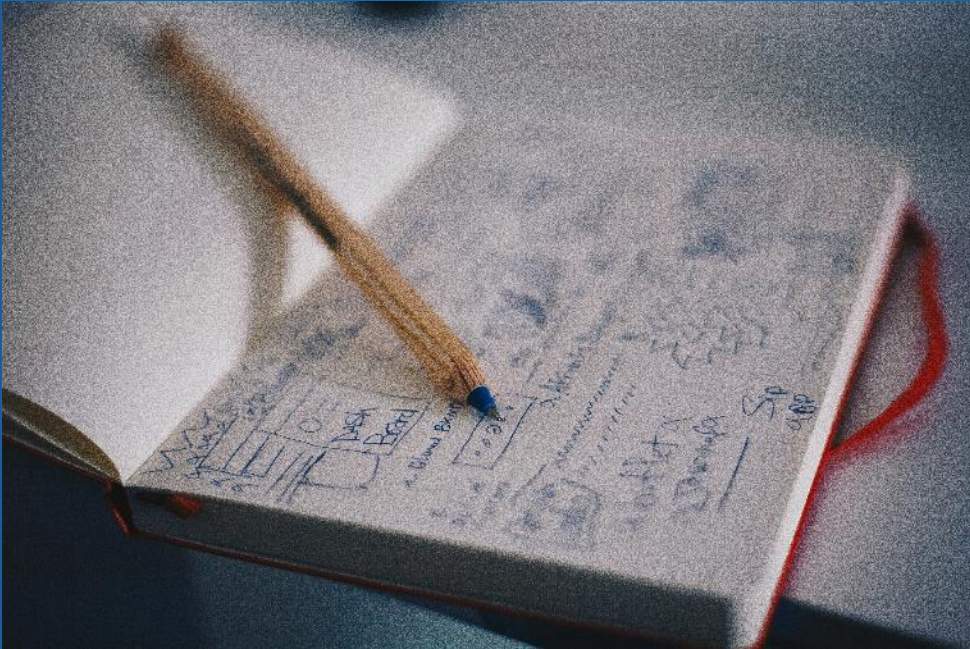
Support provided:

One off questions, troubleshooting,
brainstorming



A course sequence hit gold

- Excellent plan for before, during, and after assessments
- How do we bring everyone back together?



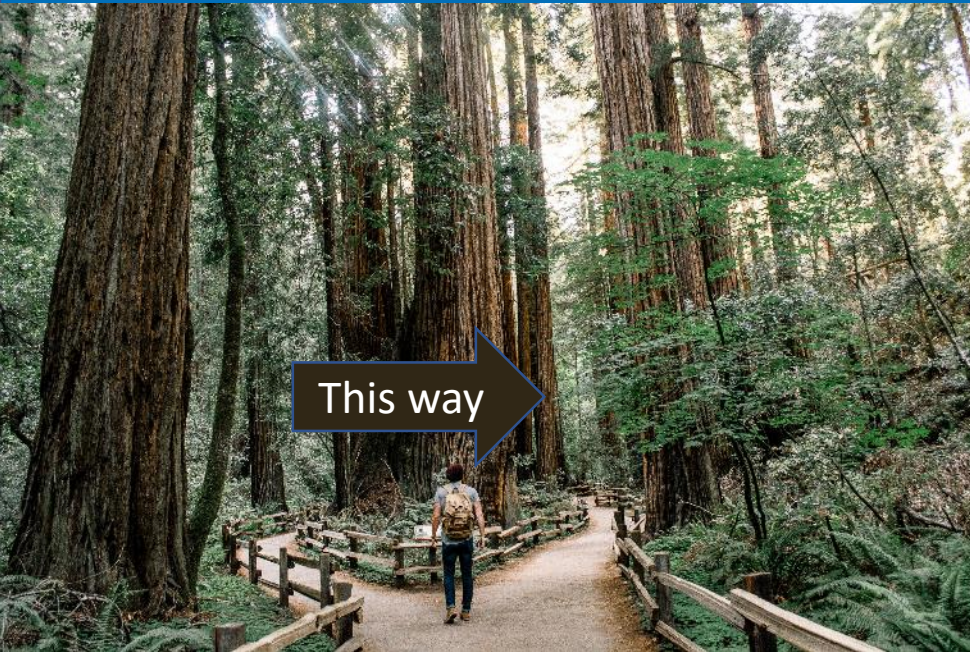
How we changed

Cognitivism states...

"The problem can exist in only two states: (1) unsolved and (2) solved; there is not state of partial solution in between."

(Hergenhahn & Olson, 2005, as cited in Merriam et al., 2007, p. 285).

- Began a library of job aids
- Ongoing support
- Uniformity became the goal
- Everyone needs to take the same path (sorry Robert Frost)



Leading up to a change

2014: Implementation of electronic assessment platform

2015-2017: Consistency of coordinators achieved (specifically within course sequences)

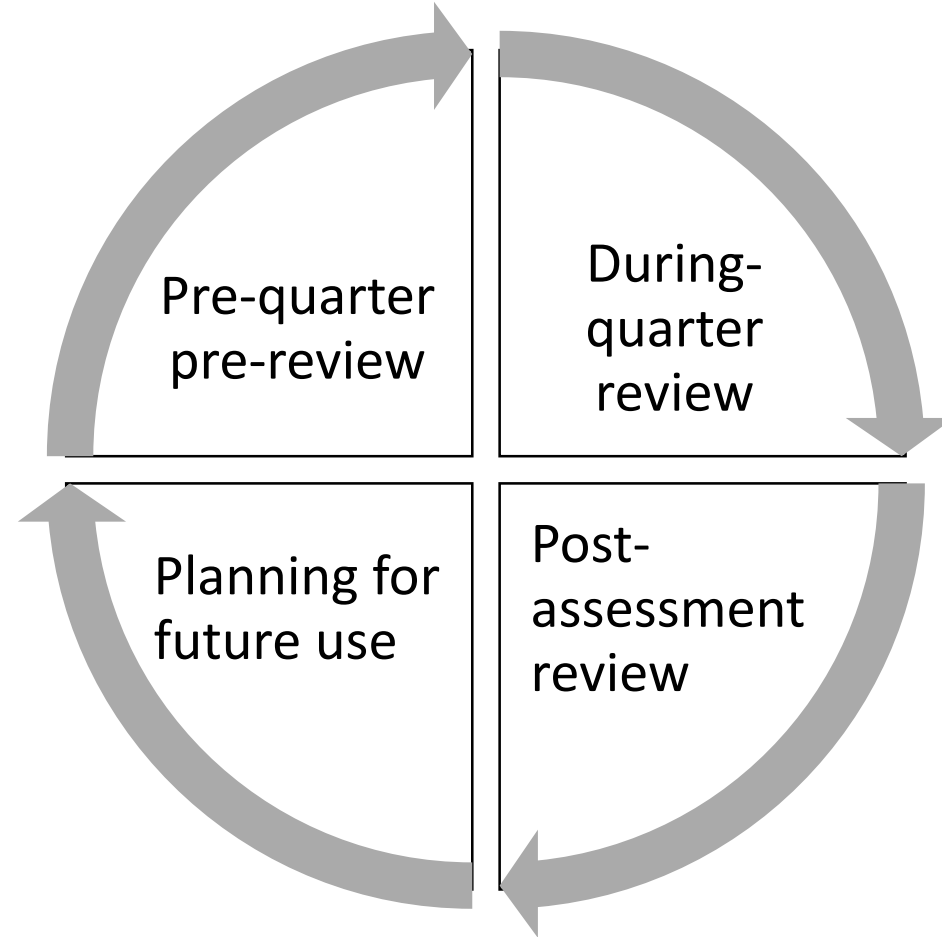
2018: Course reliability, validity, and remediation discussions begin

Working through the change

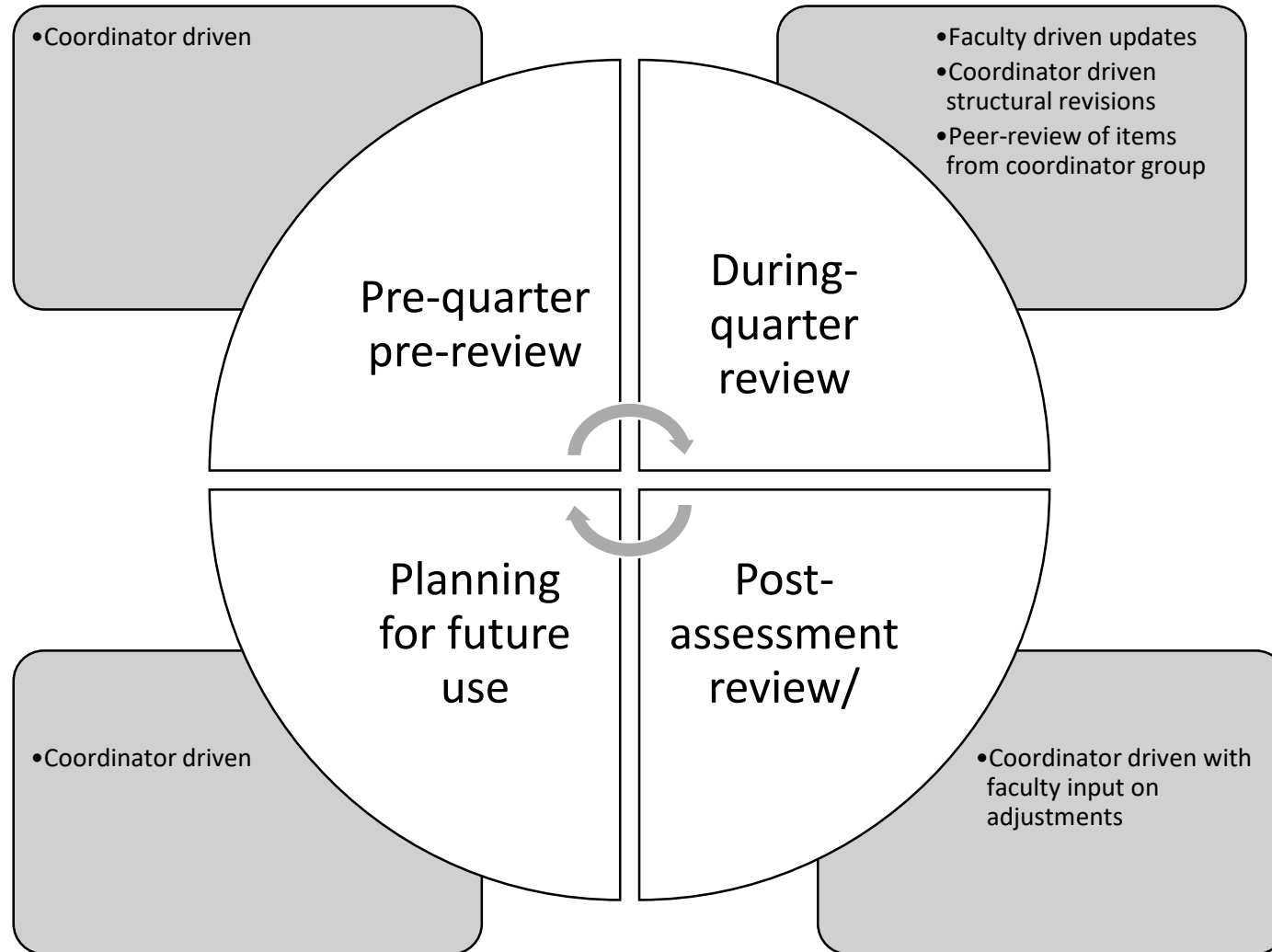
- **This process is a work in progress.**
- Focus originated in major course sequences
- One sequence tried enough things to finally find a process that works
- Subtle influences on other course sequences due to word of mouth

- Currently, we are attempting to build consensus on "best practices" in item creation and assessment construction across a larger portion of the curriculum/program.

Cyclical review & planning process



Cyclical review & planning process



Coordinator guidance vs faculty ownness

- Coordinator “pre-chooses” what items can be re-used again and “hides” ones that are not deemed appropriate
- Coordinator provides faculty with tools to improve item writing
 - Internal comments on individual items
 - General job aids on item creation (stylistic considerations, P/P reminders, etc.)
 - Clear expectations set on what additional items are needed and focus of items (objectives not assessed, needs for final vs interim exams, etc.)

Maintaining intentional focus

- Instructional objective mapping
- Consistent (and correct) content/objective mapping
- Inclusion of solid rationale (for missed items)
- Stylistic best-practices

Looking backward- What has improved?

- Exam creation time
 - Increase in creation time initially
 - Overtime exam creation time has decreased by an average of 30%
- Blueprint consistency
- Performance of the exam (KR20)
 - Pre-implementation average: 0.76
 - Post-implementation average: 0.78
- Post item adjustments
 - Number of adjustments pre-implementation: average of 4-5 questions per assessment given full credit or made bonus
 - Number of adjustments post-implementation: 1-2 question given full credit or made bonus

First Impressions on the data

KR-20 Scores by Exam for PHR 6001

	Exam 1	Exam 2	Exam 3
2018	0.75	0.65	0.6
2019	0.6	0.7	0.76
2020	0.78	0.74	0.71

Looking forward: What continues to change

- Overarching education for all faculty (live and on-demand development sessions) covering a multitude of topics including assessment data evaluation, educational theory, etc.
- Getting buy-in from various stakeholders

Resources matter!

- Workflow tools and job aids are critical for success
- Include resources & templates for all steps of process including:
 - Pre-planning (at coordinator & faculty level)
 - Assessment blueprinting
 - Exam question review (how to adjust items)
- Make these resources very easily accessible

Link: <https://libguides.sullivan.edu/sucophstechsupport>



[Sullivan University Library](#) / [Research Guides](#) / [COPHS](#) / [SU COPHS Faculty & Staff Technology Support](#) / [Home](#)


SU COPHS Faculty & Staff Technology Support: Home

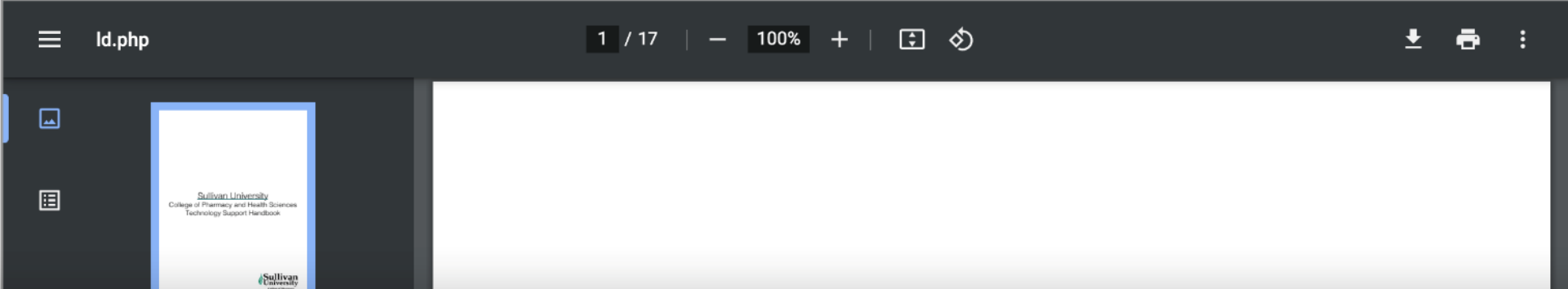
- Home
- Active Learning Strategies
- Blackboard Support ▾
- Examsoft ▾
- Microsoft Office Products ▾
- Changing Passwords
- Learning Modules / Articulate Products
- The Word from the HERD
- Panopto - Video Recording
- Using the Podiums in the Auditoriums

Search

Box 1

Let's get started. Please download the handbook below.

-  [Faculty Technology Handbook](#)

A screenshot of a PDF viewer showing the first page of a document. The viewer interface includes a top bar with a hamburger menu, the filename "Id.php", page number "1 / 17", zoom level "100%", and icons for back, forward, download, print, and a settings menu. The document content shows the Sullivan University logo and the title "Sullivan University College of Pharmacy and Health Sciences Technology Support Handbook".

Resource example: Structured review of assessment items

ASSESSMENT ITEM BEST PRACTICES

Please use this checklist as a reminder of assessment item best practices.

GENERAL REMINDERS

- Test comprehension and critical thinking, not just recall
- Use simple sentence structure and precise wording
- Place most words in the item stem
- Don't teach in the item stem
- Avoid being tricky...you are only tricking yourself
- Avoid negatives and avoid double negatives at all costs
- Keep the number of options consistent between items (i.e. The correct answer + 3 distractors)
- Keep all answer options parallel
- Avoid T-F, "all," or "none of the above"
 - o Select-all-that-apply (SATA) should never be only one option and never all options
 - o K-type items (A & B; A, B, C; etc.) are not permissible
- Make all distractors plausible; all distractors should be chosen at least once
- Limit SATA items to a bare minimum
- Please name the item using the following nomenclature:
 - o **Lecturer_Topic_InstructionalObjective_Descriptor**
 - Ex: Raake_COPD_Obj5_LAMAStep



ASSESSMENT ITEM CHECKLIST

- Is the item clear and concise?
- Is the item clinically accurate?
- Is the item relevant to the topic and at a minimal competence level of instruction?
- Is the item applicable to a novice level generalist?
- Did you include all pertinent information in the question, including drug name, dose, route, frequency, duration, etc.?
- Does the item have a performance history? If so, what does it show? Can that information be used to make revisions?
- Are there any internal comments that can guide revisions?
- Is everything mapped in ExamSoft correctly?
 - o Author's name
 - o Curricular topic ([ACFE Appendix 1](#))
 - o Bloom's taxonomy level
 - o Programmatic outcome (1.1, 2.1, 2.2, etc.)
- Is the instructional objective mapped in the nomenclature?
- Is the instructional objective mapped **correctly**?
- Are there an appropriate number of items for each instructional objective covered?
- Is the item stylistically appropriate?
- Have you checked spelling and grammar in both stem and options?
- Is there a rationale included with appropriate level of detail (not referencing a specific slide #)?
- Is the item in the appropriate [ExamSoft](#) folder?

Resource example: Posting assessments

Examsoft - Assessment Level Posting Options

Please check off each step of this process. Then you may give this form to your proctor.

My Check List	
<input type="checkbox"/>	Create a title
<input type="checkbox"/>	Choose a folder
<input type="checkbox"/>	MAX points > 0 *
<input type="checkbox"/>	Check Percentage
<input type="checkbox"/>	Check Raw Score
<input type="checkbox"/>	Check security options
<input type="checkbox"/>	Set time limit
<input type="checkbox"/>	Note the universal resume code (keep it secured - no students)
<input type="checkbox"/>	Backward navigation

ID: 5081 Posts: 0	Naming Convention: Course# or Title _ Description
Title: 5400_PublicHealth_Exam3	
Type: Exam	
Creator: Stephens, Ben	This is to help stay organized. No student will see it yet.
Folder: Change Folder * PHR 5404: Public Health	
Blueprint	
Pre-Assessment Notices	
Scoring	Caution: Avoid Max Pts: 0 Most faculty set the weight when the question was made. Default weights is typical
Maximum Points 66.00 points	
<input checked="" type="radio"/> Default weights <input type="radio"/> Assign evenly to all <input type="radio"/> Assign proportionally <input type="radio"/> Custom	
Display Scores on Exit	Most common setup
<input checked="" type="checkbox"/> Percentage <input checked="" type="checkbox"/> Raw Score	
Security Options	Please check all of these. Time limits are decided by the course coordinator Take note of the <u>secure</u> URC
<input checked="" type="checkbox"/> Secure <input checked="" type="checkbox"/> Randomize Sequence <input checked="" type="checkbox"/> Randomize All Choices <input checked="" type="checkbox"/> Time Limit: 55 minutes Universal Resume Code BF6175	
Options to Enable	Mostly common setup

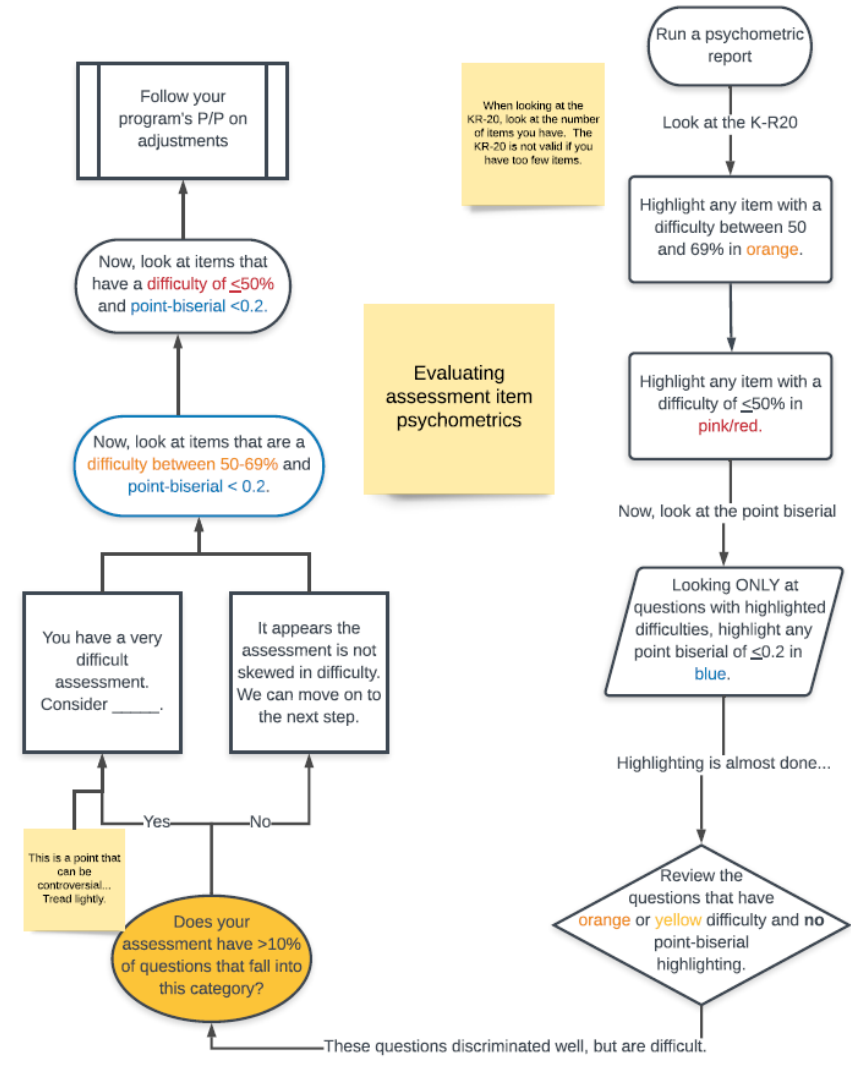
Resource example: Structured review of assessment items

Order	Question Title	ID/Rev	Weight	difficulty	Pt	Biserial	disc index	Q-index	Notes
1	Faculty1_Pain_Obj 5_Non-pharmacologic therapies	97549	1	0.94	0.38	0.09	1.03		
2	Faculty1_Pain_Obj 8 & 12_Constipation Treatment	67696	1	0.95	0.25	0.09	1.04		
3	Faculty1_Pain_Obj 2.3_Classify Pain	20493	1	0.84	0.32	0.27	1.11		
4	Faculty1_Pain_Obj 10_Opioid Allergy Action	60745	1	0.86	0.21	0.07	0.93		
5	Faculty1_Pain_Obj 11 & 12_PCA hydromorphone to PO morphine	93801	1	0.56	0.24	0.27	0.83		
6	Faculty1_Pain_Obj 11 & 12_PO conversion Oxycodone to Hydromorphone	13191	1	0.73	0.24	0.26	0.99		
7	Faculty1_Pain_Obj 14_PO conversion IV hydromorphone - Oxycodone	97287	1	0.55	0.32	0.37	0.92		
8	Faculty1_Pain_Obj 1_Pathophysiology Modulation	36179	1	0.69	0.36	0.39	1.08		
9	Faculty1_Pain_Obj 2.7.12_Neuropathic Pain Treatment	16769	1	0.88	0.18	0.17	1.05		
10	Faculty1_Pain_Obj 4_Back Pain Guidelines	58762	1	0.67	0.24	0.33	1.00		
11	Faculty1_Pain_Obj 7.11.12_Fentanyl Patch Candidate	25383	1	0.70	0.14	0.05	0.75		
12	Faculty1_Pain_Obj 7_Drug Properties - Codeine	58827	1	0.89	0.37	0.23	1.12		
13	Faculty1_Pain_Obj 7_Hepatic Impairment	56696	1	0.91	0.18	0.09	1.00		
14	Faculty1_Pain_Obj 8_Most common ADE	14846	1	0.95	0.2	0.09	1.04		
15	Faculty1_Pain_Obj 9_Respiratory Depression Treatment	32735	1	0.52	0.14	0.04	0.96		
16	Faculty2_Bipolar_Obj 4.5_Acute mania	96647	1	0.84	0.26	0.23	1.07		
17	Faculty2_Bipolar_Obj 3_VPA Monitoring	16522	1	0.66	0.02	0.06	0.72		
18	Faculty2_Bipolar_Obj 4_Combination agent	55693	1	0.52	0.52	0.67	1.19		
19	Faculty2_Bipolar_Obj 4_Lithium Interaction	27521	1	0.59	0.09	0.08	0.97		
20	Faculty2_Bipolar_Obj 1_Diagnosis	63897	1	0.56	0.05	0.09	0.65		Bipolar 1 vs 2 diagnosis question, tough
21	Faculty2_Bipolar_Obj 3_Pancreatitis	4951	1	0.84	0.18	0.27	1.11		
22	Faculty2_Bipolar_Obj 4_Lithium_Armfeeding	93950	1	0.86	0.41	0.32	1.18		
23	Faculty2_Bipolar_Obj 4.6_Lamotrigine_dose	38778	1	0.61	0.48	0.53	1.14		
24	Faculty3_SUD_Obj 2_Fixed dose taper for AUD	26129	1	0.59	0.41	0.52	1.11		
25	Faculty3_SUD_Obj 4_Benzo_OD_treatment	21736	1	0.98	0.13	0.05	1.03		
26	Faculty3_SUD_Obj 1_Negative_Reinforcement	6277	1	0.70	0.17	0.24	0.94		
27	Faculty3_SUD_Obj 2_Intoxication	83247	1	0.84	0.44	0.36	1.20		
28	Faculty3_SUD_Obj 2_Thiamine	33506	1	0.67	0.25	0.25	0.92		
29	Faculty3_SUD_Obj 3_MCA_disulfiram	8802	1	0.73	0.41	0.45	1.18		
30	Faculty3_SUD_Obj 3_QTC_boxed_warning	67085	1	1.00	0	0	1.00		
31	Faculty3_SUD_Obj 4_Front_Load_Therapy	5729	1	0.56	0.08	0.09	0.65		Weirdly worded question on front-loading
32	Faculty3_SUD_Obj 4_Pregnancy	56619	1	0.77	0.21	0.22	0.99		
33	REVIEW_Faculty5_B&J_Obj 6_AdjRampam	63386	0	0.84	0.3	0.27	1.08		
34	REVIEW_Faculty5_Endocarditis_Obj 1_IncreasingAmongVDU	932137	0	0.89	0.26	0.44	1.28		
35	REVIEW_Faculty5_UnstableAngina_Obj 1_TafrolinA	96292	0	0.44	0.14	0.09	0.20		
36	REVIEW_Faculty7_Std-Obj 6_GonorrheaTreatment	11938	0	0.94	0.04	0.06	0.44		
37	Faculty4_ADHD_Obj 2_Diagnosis	416.810	1	0.55	FITB	0	0.55		Fill-in-the-blank question regarding age of dx
38	Faculty4_ADHD_Obj 4_Genomics	59581	1	0.63	0.36	0.28	0.91		
39	Faculty4_ADHD_Obj 4_Monitoring_Child	15703	1	0.88	0.23	0.13	1.01		
40	Faculty4_ADHD_Obj 4_Risk_of_Hypotension	54738	1	0.83	0.53	0.41	1.24		
41	Faculty4_ADHD_Obj 4_Assessment	88888	1	0.88	0.28	0.13	0.90		

Use numbers from the item analysis, not the summary report!	
Pt Biserial x0.2	Difficulty <70% Q index < 0.69
Q-index	Sum of difficulty and discrimination index
	=SUM(difficulty disc index)
Faculty1 difficulty average=	72.25%
Faculty2 difficulty average=	80.27%
Faculty3 difficulty average=	76.00%
Faculty4 difficulty average=	81.13%



Resource example: Adjusting items



Small wins occur early



Confidence in course performance improves



Consistency increases within course and between courses in sequence



Faculty and coordinators learn

Barriers to broader implementation

- Initial investment of time and resources (especially first year or two of implementation)
- Pre-work required before course begins (reviewing items, etc.)
- Buy-in is crucial- from both faculty and coordinators
- More work/authority at coordinator level
- Concern regarding loss of “academic freedom”
- Lack of education on best-practices (on educational theory and general educational best practices)

How is this process useful to both Faculty,
Students, and College Administration?

Faculty

- Less student questions about exam questions
- More consistent in grading across exams as well as courses
- More data to guide course remediation design
 - Strengths and Opportunities reports
 - Objective's spreadsheet/mapping information
 - Assessment blueprinting
- More support of faculty grading decisions if student appeals

Students

- More data to prepare for comprehensive finals
 - Strengths and Opportunities reports
 - Objective's spreadsheet/mapping information
 - Assessment blueprinting
- Data to help students study for course remediation exams (if needed)
- Students can further cement knowledge through review of the exam question rationales

Administration

- Administrative data is always available for appeal situations...
 - Valid psychometric analysis
 - Consistent item review process
- Programmatic assessment data is "clean" and consistent
- Less student complaints on student surveys as students feel they are getting clear feedback

Key takeaways

- No "one size fits all" approach (slight variations between course sequences and departments)
- Need clear communication
- Need Administrative support to ensure the rules that are put in place are followed. Consistency is important!



Building a better exam: Using educational theory to standardize assessment construction and review processes

Kimberly Daugherty, PharmD, PhD, BCPS
kdaugherty@sullivan.edu

Sarah Raake, PharmD, MEd, BCACP, LDE
sraake@sullivan.edu

Ben Stephens, M.Ed.
bstephens@sullivan.edu