QUALS AND PRELIMS AND COMPS, OH WHY!?

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Graduate Student Seminar 2022

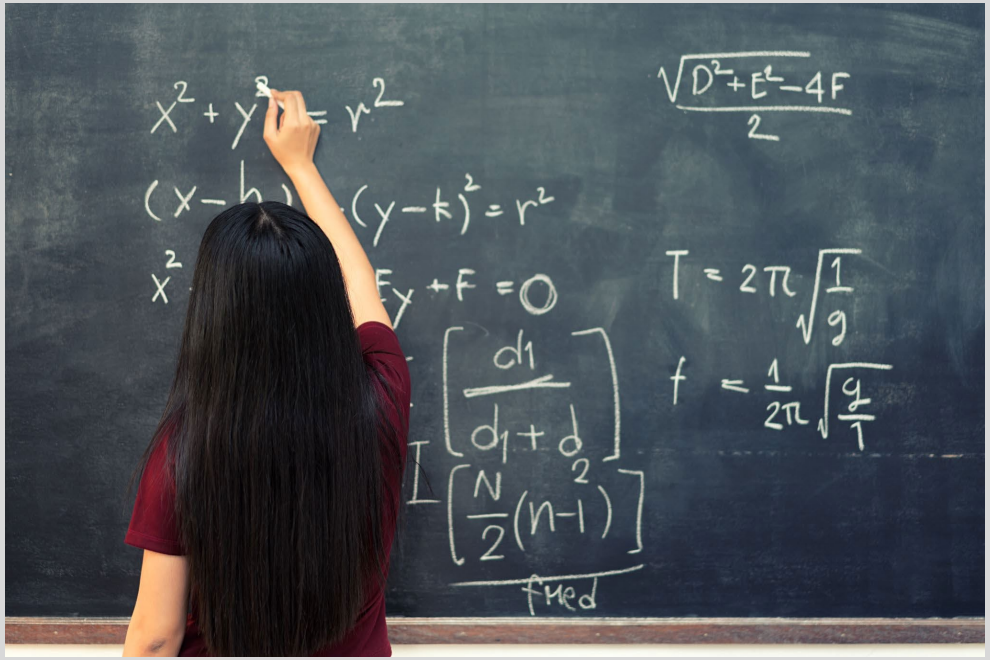
Outline

- What are qualifying exams?
- Why We should Care (How I started to care)
- How do various programs conduct qualifying exams? (Spoiler: no standard)
- Signs You may need to rethink your qualifying exams
- Roadblocks to Change
- Where can we Reform?
- Where do we go from here?

WHAT ARE QUALS? WHY DO WE CARE?

Define Qualifying Exams…

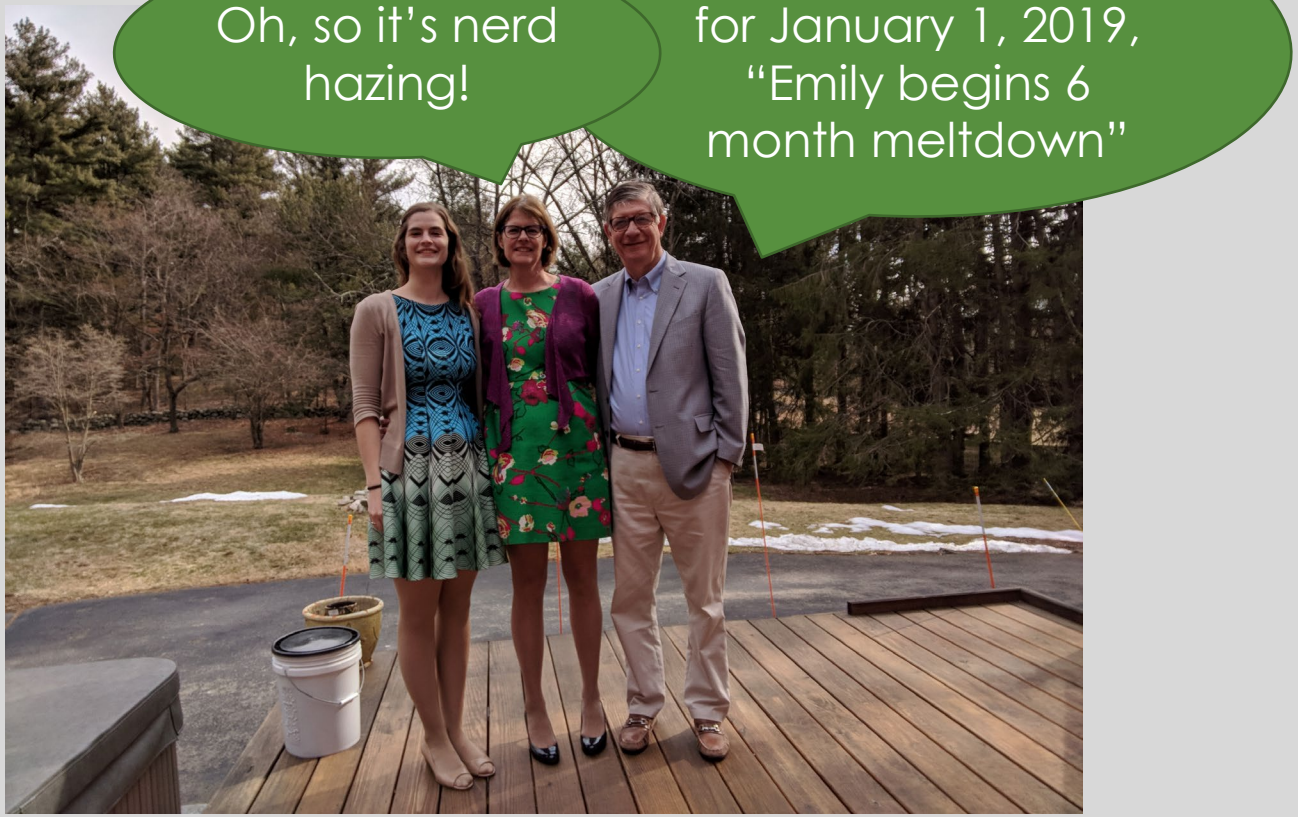
- Called qualifying, preliminary, and/or comprehensive exams
- "Ph.D. qualifying exam is an examination required for all doctoral students to prove their preparedness and capabilities to apply and synthesize the skills and knowledge during the graduate program. Another term for this exam is a "preliminary exam," or a "prelim"." – Dr. Tyasning Kroemer, "Everything about the PhD Qualifying Exam and Tips for Success"



How Brown Applied Math Does Prelims

- We pick four topics (two “major”, two “minor”) from a list of topics. One topic is allowed to be proposed or from outside the department
- Each topic is based on two semester-long courses (usually a sequence)
- Each topic is examined for one hour orally. Anything from the classes is fair game.
- The “major” exams are taken back-to-back (a two-hour session), and the “minor” exams are taken back-to-back. All exams must be taken within two weeks.
- After each session, the committee deliberates and decides whether the student passes or fails

Reality Check from my parents



How Brown Math Does Quals

- You get "qualifying credits" by passing classes, at the discretion of the professor
- If you don't master the material in a course sufficiently, you take an additional exam or you retake the class
- The Exam is a "topics exam"
  - The student sets a reading list with their advisor, which consists of one or more research papers in their area
  - There is a 45-minute presentation on these topics, followed by a 45-minute period of questions from the committee, and then a closed-door vote for whether the student passed.

How Brown Molecular Pharmacology and Physiology Does Quals

- Write an NIH proposal of their thesis research with their advisor
- Oral research proposal, followed by a question session from a committee
- Most students get a "conditional pass" and get feedback on how to adjust their research plan
  - Practice reading "reviews" and responding to their concerns

THERE'S GOT TO BE A BETTER WAY!

GIF from http://2damnfunny.com/theres-got-to-be-a-better-way-to-hold-jar/

WHAT DO OTHER PROGRAMS DO?

Results from the Qual Survey!

Some do written exams!

Program	# of Exams	Time span	When offered	Grades	Topics	Pass by
Columbia U. APAM	1	4 hours per day, 2 days	End of first year	Pass/fail	General, specialized questions	End of second year
Clemson U. Math	2	4 hours	Twice per year	Pass/fail	Pick from list of 6	End third year
U Illinois Chicago Math	3	3 hours	End of spring semester	1 (best), 2, 3, 5 (fail). Need two majors <= 4, total <= 6	Pick from list of 12; minor exam can be courses	End third year
U. of Arizona Math	3	3 hours	Twice per year	High pass, pass, fail (need 2 HP, 1 P)	Analysis, algebra, geometry/topology, master's thesis	End third year
U. Of Denver Math	2	3 hours	Twice per year	Pass/fail	Analysis, Algebra	Winter quarter second year

Some give oral exams!

Program	# Exams	Format	Grades	Topics	Pass by
Boston College Math	1	Take home set (1 week), then questioned	Pass/fail	Research Topic, Secondary Topic	End of third year
Dartmouth College Applied Math/Math	1	Oral exam (length unspecified)	Pass/fail	Summer research project or "advanced topics"	Before start of second year
Boston U. Math	1	3 Hour oral exam	Pass/Fail	Pick 2 from list of 14	Before Start of third year
U. of Virginia Math	1	1 Hour oral exam	Pass/Fail	2-3 Second year courses	Take May Second year, remedy by August

Some give… no exams!

Program	Classes	Research Exam/Presentation	Other requirements
Cornell U. Math	Yes, take them	"A Exam" Oral presentation on research topics	Language
Duke U. Math	And that's it	Oral exam on research topics	
Oklahoma State U. Math	You passed.	• Preliminary research project, with written document and oral presentation • Oral exam on reading list determined by student; Oral research proposal	
U. of Illinois UC Math	You're good now	Oral research proposal, no more than 2 hours (45 minute presentation, Q&A follow)	

THERE IS NO STANDARD WAY FOR MOVING TO CANDIDACY!

TOXIC PRACTICES THAT NEED TO GO

Retaking all exams even if a student fails one

- If the exams are separate – they already passed one… They have demonstrated that knowledge.
- Some do this because topics are combined into one exam
- **Can narrow the scope of the exam!**

Forcing students to take all exams at once

- Two forms:
  - All topics combined into one long exam
  - Topics form separate exams, but they all must be taken within a one-two week period
- Ask yourself: Is this format for the benefit of students or the convenience of the department faculty?
- This format makes the exam process a physical feat as well as a mental feat

No appeals process, ignoring accommodation requests

- Faculty have an inherit power imbalance here
  - Exams determined often by committees/discussions in effort to take in all context
  - Some determine "pass" by a fixed score, others relative to other students, or depends on relativity to research area
- If a student can't challenge or question the results, you leave the door wide open for abuse and discrimination
  - Eg, students may be held to different standards by different examiners, advisors
  - Or the same advisor expects higher performances from certain students
- Accommodations ARE NOT OPTIONAL, especially when they come through the university

Only giving exams once per year, even for retakes

- This raises the stakes even higher than they already are
- Unnecessarily prolongs the process
- Minimizes opportunity to pass
- Consider allowing an additional slot for retakes only

Image from https://www.greenbiz.com/article/why-stakeholders-are-raising-pressure-us-business-leaders-address-climate

Using the exam to “weed out” students

- You should do this in admissions
- Kicking students our after not passing leaves them without insurance (in the US), often unemployed, without visa
- Some schools use the surplus of first- and second-year students to help with the teaching load
- If that’s the case, either fund a master’s program for people to apply to or be very transparent with this to prospective students

GIF from https://imgur.com/lxiJD0q

MORE SUBTLE SIGNS IT'S TIME FOR CHANGE

Trigger warning: mental health, weight gain/loss, gaslighting

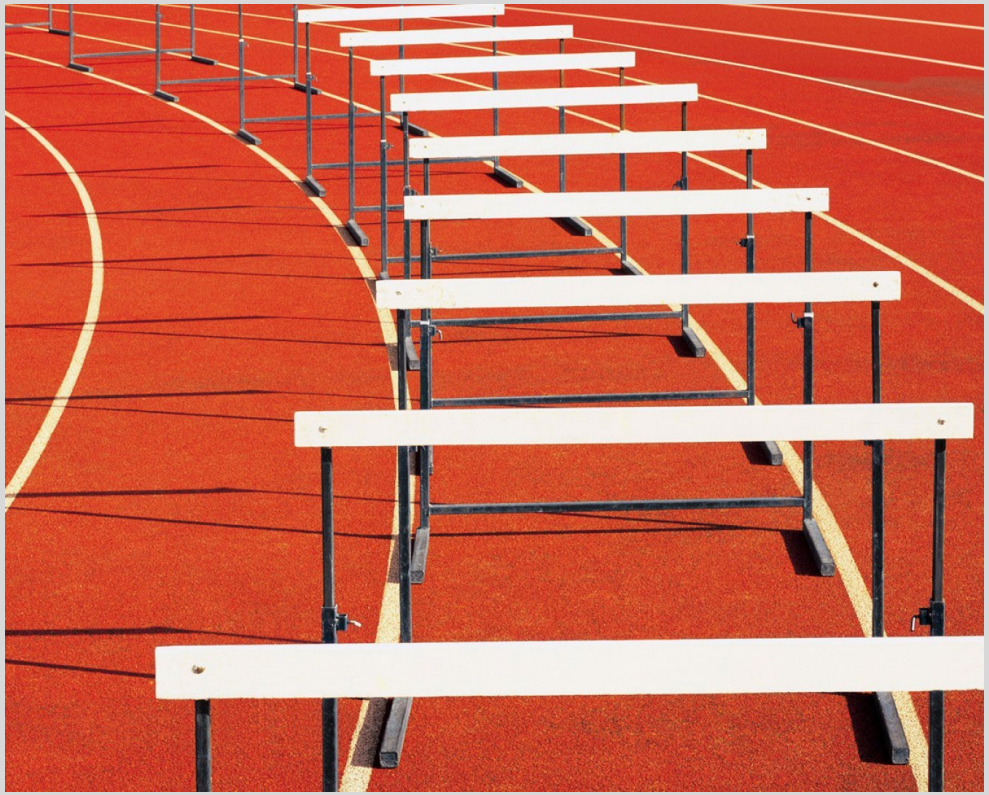
Mental Health of Students is Deteriorating

- Crying in your office or just in the open
- Staying late hours, not getting sleep
- Discussing nightmare patterns leading up to and after the exams
- Discussing weight changes, diet changes

Disconnect between professors and students

- "It's not an exam to penalize you, it's an opportunity to go through your course material a second time!"
- Students are stressing out, but professors say, "this isn't a big deal"
- Students express concern that they aren't related to their field, but professors say "this will help you in the long run even if you can't see it"
- Students are burnt out after exams, but professors say "Well it's over so no need to worry about it"

Professors view it as “a hurdle” to clear



- When professors say this, they implicitly admit they only have their students do it because it’s a program requirement
- Hurdles can be removed from the track!

Image from https://www.inc.com/14-tips-for-jumping-entrepreneurships-hurdles.html

Other Signs It's Time for Change

- Low pass rates or different pass rates for different groups
  - You want the overall pass rate to be 80-90%, and you want it equal among different demographics
  - How many students ultimately pass?
  - How many attempts do students need to pass? (Simpson's paradox)
- Students need more classes after they pass quals to successfully complete research
  - Then the quals didn't serve their purpose. Change them!
- Students don't get prompt feedback
  - At this point, you're just playing mind games
  - Set expectations for feedback timeline (eg, 1-2 weeks), and stick to it

ROADBLOCKS TO CHANGE

What you will hear from the stubborn people in power…

“Ugh, but then we have to hold a faculty meeting”

- Translation: It’s too much effort to change so we’re not going to change it.
- How to navigate:
  - Organize other faculty members
  - Come in with the proposed changes already set up, pitch them
  - Get votes ahead of time

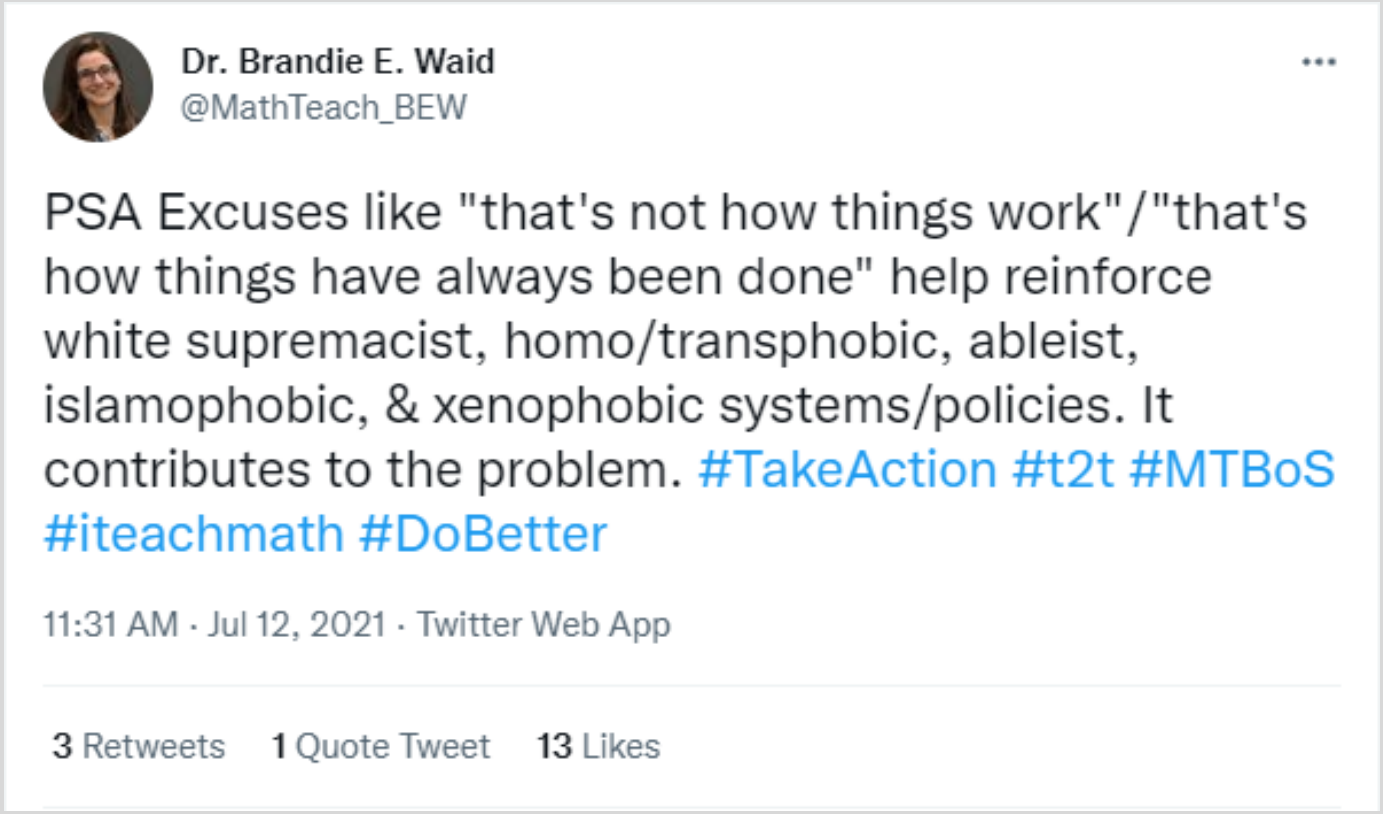
Photo from https://www.someecards.com/usercards/viewcard/3747798d1f4c721841bf573d14edd22a/

“It helped me when I was a student!”
“I didn’t think it was that bad!”

- Congrats! Good for you!
- Survivor bias
- Consider how math and your department have evolved since you were a student
- At Brown APMA – 6 of 22 active tenure-track faculty got PhD in Brown APMA

Photo from https://cheezburger.com/8428265216/cool-story-bro-old-people-edition

“It’s tradition!” “It’s how we have always done things”



Dr. Brandie E. Waid
@MathTeach_BEW

PSA Excuses like "that's not how things work"/"that's how things have always been done" help reinforce white supremacist, homo/transphobic, ableist, islamophobic, & xenophobic systems/policies. It contributes to the problem. #TakeAction #t2t #MTBoS #iteachmath #DoBetter

11:31 AM · Jul 12, 2021 · Twitter Web App

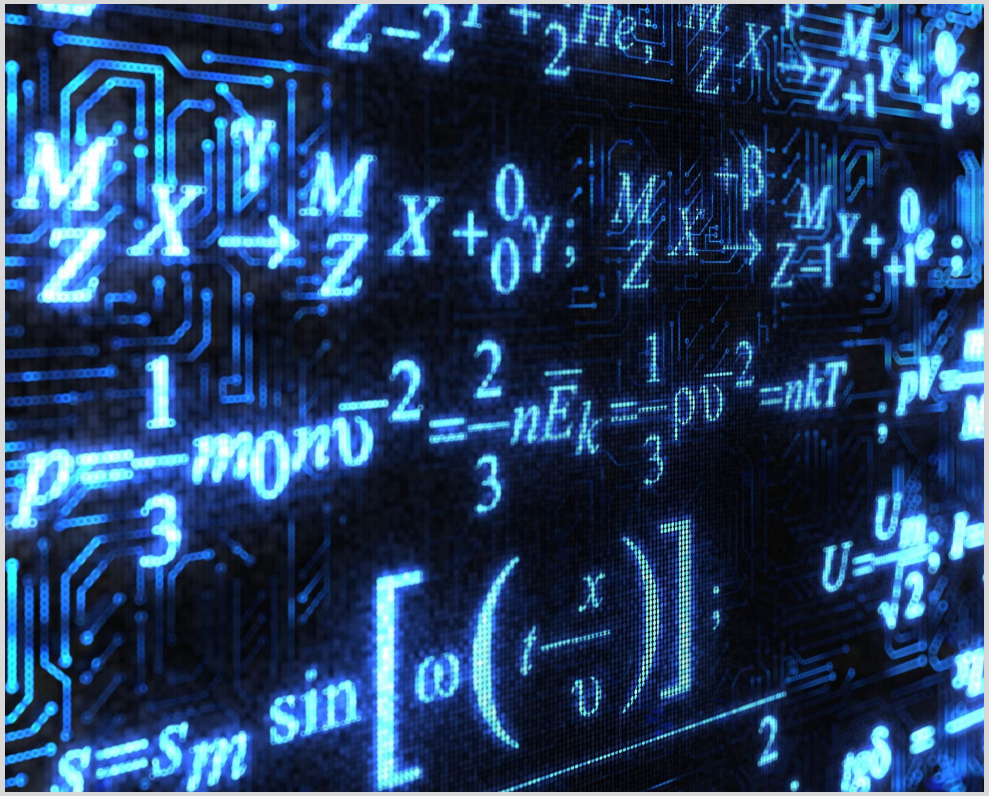
3 Retweets 1 Quote Tweet 13 Likes

“Removing exams will diminish the prestige and rigor of our program”

- While not great phrasing, there will be some skepticism
- Invite them to speak to colleagues in departments where such changes have been implemented
- Faculty in these departments – talk about the process of implementation!

Photo from https://www.istockphoto.com/photo/better-luck-next-time-gm1141421597-305787919?utm_medium=organic&utm_source=google&utm_campaign=iptcurl

“But how will we know you can do research?”



- When their advisor trains them to do research
- If it’s really about research, make the process centered around research
  - Research proposals
  - Mock grant submissions
  - Reading papers
  - Exam where the student and advisor submit a syllabus to a committee

“But how will we know you can think on the spot?”

- Do we really need to do that?
- Other ways to develop that skill
  - Group meetings
  - Department seminars

GIF from https://www.goodreads.com/review/show/1102366350

WHERE CAN WE REFORM?

And where do we go from here?

Bring it back to research and the goals of the program

- If you want your students to be prepared for academia...
  - Mock NSF grant proposal
  - Bonus… set them up to apply for graduate fellowships!
- If you want your students to be prepared for industry…
  - Project using industry data, present a report
  - Internship
- Preparing students to do research and be lifelong scholars…
  - Teach how to search for papers and read them
  - Discuss papers relevant to their research area
  - Oral research proposal and research plan

Be clear about standards

- Post a syllabus for each subject
  - You probably already have this for your classes anyway!
- Post previous exam questions
  - Bonus: Use as inspiration for creating the next exam!
- Record and document feedback, regardless of exam format
  - Feedback should be specific to the student. They should know exactly why they did not pass an exam and what they need to do to succeed on the next attempt
  - Makes the appeals process fair on both sides
- Consider a "conditional pass option"
  - Instead of pass vs fail – and fail is retake the exam – have students do an additional assignment, problem set, or project
  - Especially good if the performance may have been impacted by anxiety or outside events (eg, global pandemic, natural disaster/war in home country), or student was close to passing but not quite there.

Offer flexible options for students

- Some may want a written exam, some may want oral exams
- Spacing out exams
- Allow them to tailor topics
- More than 1 retake – then students can use first couple as "practice"
- Research exams – give them an active role in creating that syllabus
- Accommodate students – brainstorm ahead of time ways you can adjust your exams for disabled students so they know these are available and can be asked for.

Take surveys and KEEP DATA

- Survey the faculty – how do they feel about giving these exams? How do they feel when their students are going through them?
- Exit surveys for students – what feedback do they have?
  - Power imbalance is diminished upon exit/graduation, so you'll get more honest answers
  - Also have hindsight, context for the exams within the program
- Yes, you can analyze qualitative data
- Yes, you can analyze small data sets
- Yes, you can compare data sets with different sample sizes

Where do we go from here?

- Talk to other departments, use the spreadsheet, find out what your "peer institutions" are doing.
- Fill out the qual survey! Add to the database!
- Ongoing process… you may need to tweak, evolve, address bias, etc.
- Make this a topic of conversation in your department. Organize and recruit other faculty. If faculty meetings are a pain, slip it into one already happening?
- Stay tuned… there is research about outcomes of this coming!
  - People like Dr. Tim McEldowney, Prof. Jessica Deschler, Nicholas Papalia

Thank you and good luck!