Report on student body sentiment around qualifying exams

Bárbara Cruvinel Santiago and Tuan Nguyen
on behalf of the Columbia Physics Graduate Council

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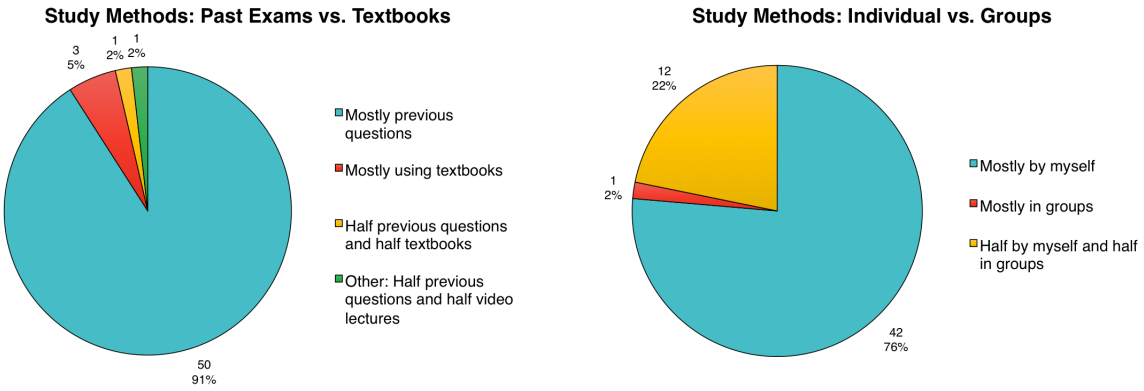
1 Introduction

In February 2020, the Columbia Physics Graduate Council (PGC) ran a survey among the Columbia physics Ph.D. program student body in order to understand how students felt about the program's qualifying exams. Currently, Columbia's physics qualifying exams (also referred to as "quals") are held once a year in mid-January and taken by first year students (or second years who did not pass them the first time). Columbia's physics quals consist of 6 written 2-hour exams on the Monday, Wednesday and Friday of quals week (two exams per day) followed by an oral examination the following week. The written exams are separated in the following sections: classical mechanics, electromagnetism, quantum mechanics, applied quantum mechanics and relativity, statistical mechanics, and various topics. If a student fails one of the sections, they need to retake the two exams offered on the day of the failed exam. In case they fail two or more exams on separate days, they need to retake all of the exams. The oral exam is typically a way for faculty to assess if students can solve questions students did not ace on the written portion, though it has been reported in the past that students have been asked completely separate questions. There is no known cutoff for passing; professors have a meeting the Friday after the oral exams to discuss who should pass. These exams have operated roughly the same way for decades.

The survey had a total of 55 respondents, encompassing students from their first to their last year of the program. Only one student identified as black/African-American and only three as Hispanic and/or Latinx. This is not surprising given that, in the Spring of 2020, the program only had two black and four Latin American students, but that also means that we don't have a good sample size (defined here as 10 or more) to evaluate responses from racial minorities without potentially identifying them. Taking into account that we don't know how many students in the department are gender non-binary, we estimate that a little more than a third of male students and over half of female students in the program responded to



(a) Material Used

(b) Individual vs. Group Study

Figure 1: Students reported preparing for the exams mostly by themselves and by solving exams from previous years available online.

the survey. 49% of respondents had taken their quals in the last two years (including 17 of 18 first-year students).

There were three demographic groups with a large enough sample to be evaluated separately: women (10 responses), international students (23 responses), and Far-East Asian students (12 responses); note that some of these responses overlap. Hence, some of the plots in this report also show separate analyses for these three demographic groups.

In this report, you will find an evaluation of how students studied for their qualifying exams, how quals impacted their choice of Ph.D. program, how effective they found quals to be, what impact quals had on students' mental health, as well as two proposed changes that got student support in the survey. We also included a section with examples of how other universities conduct their qualifying exams.

2 How students prepared

When we asked students how they prepared for their quals, most of them claimed to study mostly by themselves and solving questions from previous years (as opposed to using textbooks or other materials), as seen in figure 1. In our opinion, this goes to show that Columbia's qualifying exams currently test more whether students know very specific problem-solving strategies instead of their understanding of basic physics content. Moreover, the timing and structure of the exam are not conducive to collaboration among students and their peers.

Something worth noticing from figure 2 is that the core of exam preparation happens during winter break in the three weeks between Fall semester finals/grading and the qualifying exams in mid-January. This (as seen in appendix A) sometimes forces students to stay in New York City over the holidays to prepare. We believe this is mostly due to the

fact that first-year students have several obligations in their first semester, such as classes, teaching, grading of exams, staffing of help rooms and attending meetings to find a suitable advisor. Some students also try to get started on research, given that this should be the core of their graduate education, though the timing for our qualifying exams is not conducive to conducting research in the Fall semester of your first year. Furthermore, students reported (see appendix A) that adjusting to a new environment also prevented them from having the necessary time to prepare for the exams in the Fall.

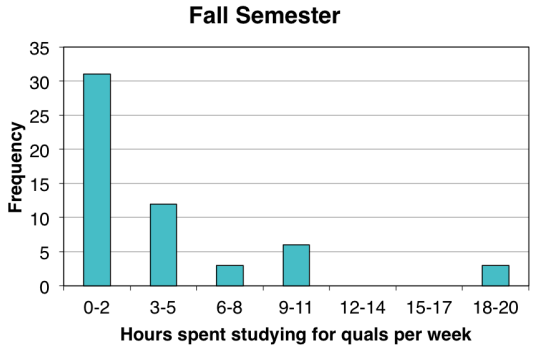
Notably, international students reported spending less hours studying in preparation for their qualifying exams (figure 2d). We believe this happens because international students tend to come from academic cultures that value exam taking more than American academia, putting domestic students at a disadvantage when taking Columbia's physics qualifying exams.

3 Impact of Qualifying Exams on Program Choice

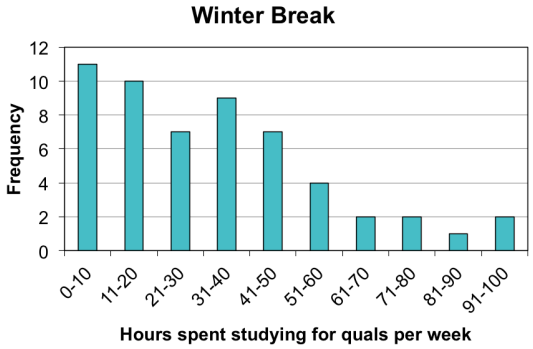
One of our survey questions asked how the structure of our qualifying exams affected students' choice of Ph.D. program. From figure 3, you can see that women were way more likely to report hesitating to accept Columbia's offer because of quals. In fact, 40% of the female respondents (4 women) said that they hesitated accepting the offer because of our qualifying exams specifically, a percentage rate roughly 20 times higher than that of men who said quals were a point of hesitation. Also note that all of the students surveyed are current Columbia students. Hence, we believe that the results are skewed towards acceptance of the current exam. If we were to survey students who did not accept Columbia's offer, we believe that even more women would mention being hesitant to accept our offer. Additionally, 5 of the 10 female respondents said that they considered leaving the program in their first year; 3 of them specifically mentioned that quals played a role in their consideration of potentially quitting the program.

While this result is not surprising given previous studies about the presence of, for instance, stereotype threat and impostor syndrome among minority groups in STEM, it is an incredibly important finding. On average, U.S. Ph.D. programs are $\sim$20% female according to the American Physical Society. Yet, at the time of the survey, Columbia's student body was less than 16% female (an all-time high for our Ph.D. program). Columbia's Ph.D. program also struggles to recruit women, and we now have a new window into understanding why that happens on top of the lack of female representation in the department.

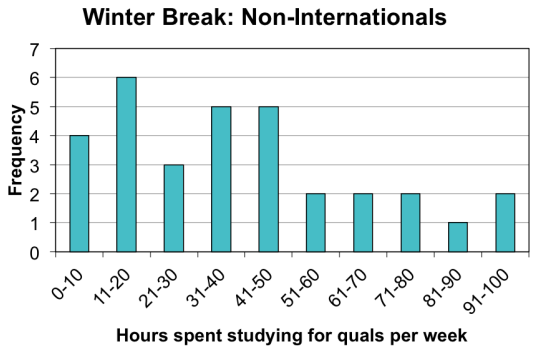
Unfortunately, we did not have enough data from students in racial minorities because our Ph.D. program is white in its majority. However, out of the 4 students who identified as a part of a racial minorities, 3 said that they should either have considered our qualifying exams more carefully or that they did take quals into consideration.



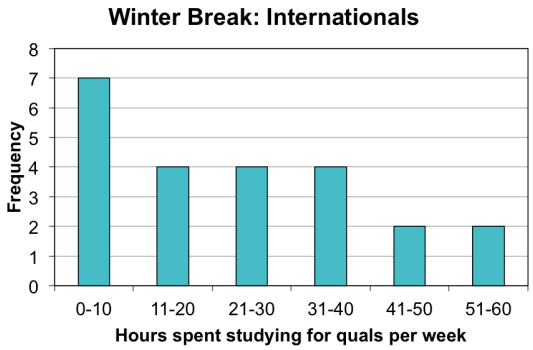
(a) Time Spent Studying in the Fall



(b) Time Spent Studying in the Winter

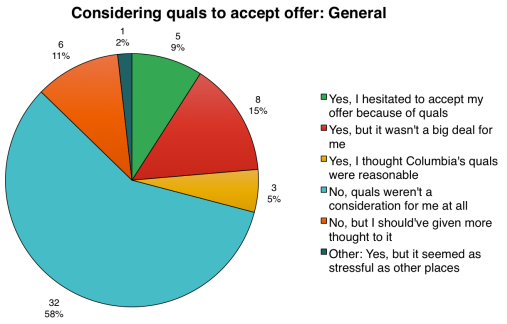


(c) Time Domestic Students Spent Studying

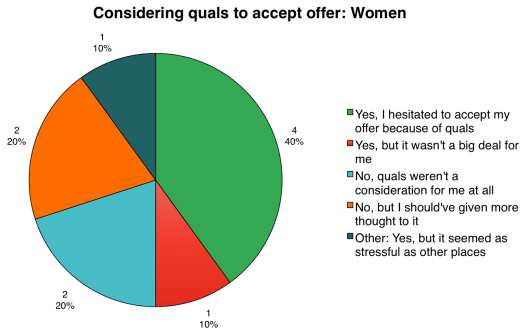


(d) Time International Students Spent Studying

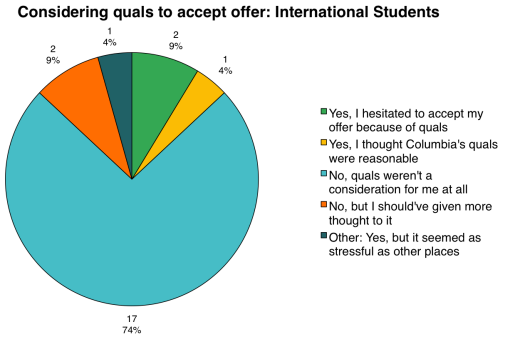
Figure 2: When asked how much time students spent studying for our qualifying exams, it was clear that the core of exam preparation happened during winter break, with domestic students reporting much longer hours of preparation. This is potentially due to the many other responsibilities first-year students have in their first semester of graduate school (classes, teaching, grading, research, adapting to a new environment, etc) and goes to show that students get little rest until the summer after their first year. The frequency of these histograms show how many students claimed to have spent an amount of hours in the ranges indicated on the horizontal axes of the plots above.



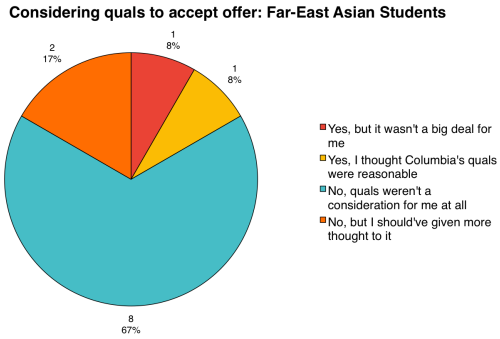
(a) General Student Body



(b) Women

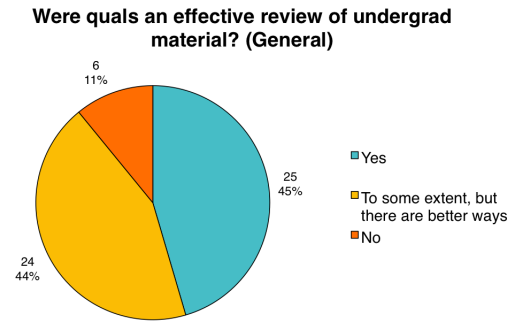


(c) International Students



(d) Far-East Asian Students

Figure 3: We also asked our student body whether Columbia's qualifying exams were a consideration when they were choosing where to go for graduate school. 4 women (40% of female respondents) and only one man (2% of male respondents) reported that they hesitated to accept Columbia's offer because of our quals; this means that women responded they were hesitant at a percentage rate that was 20 times higher than men's. Since this survey was distributed among current Columbia students, we believe that the hesitation rate might be higher among students who did not accept our offer.



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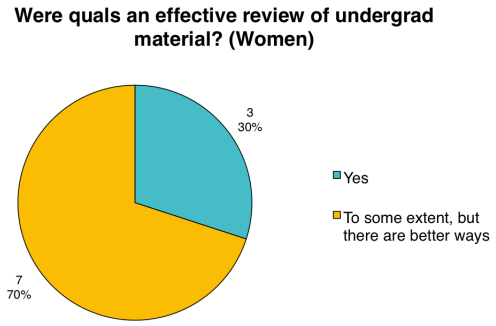
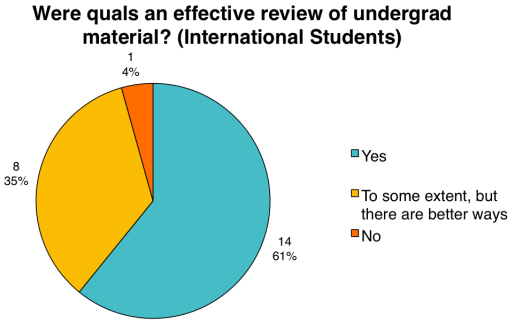
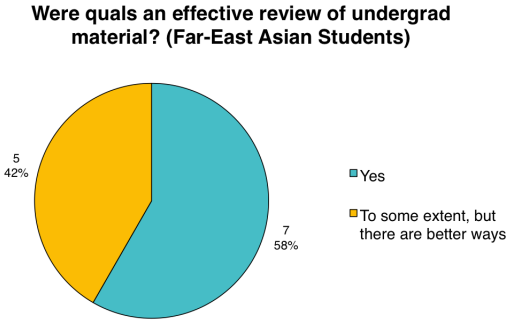


(b) Women



(c) International Students



(d) Far-East Asian Students

Figure 4: When asked whether the Columbia Physics Department qualifying exams were an effective way to revise undergraduate-level material, 55% of respondents said that they believed there was a better way to do so or that they did not find any value in it. This rate was even higher among women; 70% of them said they believed there were better ways to revise undergraduate physics material.

4 Effectiveness of Qualifying Exams

Columbia physics faculty generally claim that one of the main purposes of keeping quals the way they are is to use it as diagnostic tool and make sure that students understand undergraduate physics material. We then asked our respondents whether they felt that studying for the qualifying exams was an effective way to review undergraduate material (figure 4). 55% of respondents said either that quals weren't helpful or that there were better/more effective/less stressful ways to do so. 14 out of the 25 students who claimed quals were effective were international, who (as mentioned in section 2) tend to spend less time studying for quals and come from academic cultures centered on test taking. 70% of the surveyed women reported thinking that there are better ways to review material, potentially because studying for quals incur more stress on them, as seen in previous literature about impostor syndrome and stereotype threat in minority groups.

5 Mental Health Impact

Of the students who completed our survey, 40% explicitly mentioned incredible stress or seeking counseling related to our qualifying exams. All but four women that we surveyed mentioned mental health issues related to the qualifying exams, either during studying or after the exams. Of the four women that did not indicate stress or counseling, all of them were international students and three of the four were from East-Asian countries.

Many students mentioned feeling mentally exhausted while studying. The majority of students found it difficult to study for the quals consistently during the Fall semester due to large course loads in addition to many personal reasons. Thus, the bulk of studying for most students ended up being during the Winter break. Many students mention grueling study sessions during the break, with long hours of studying and the inability to enjoy the break with their family. Many students also note severe disruptions with sleep habits during this time.

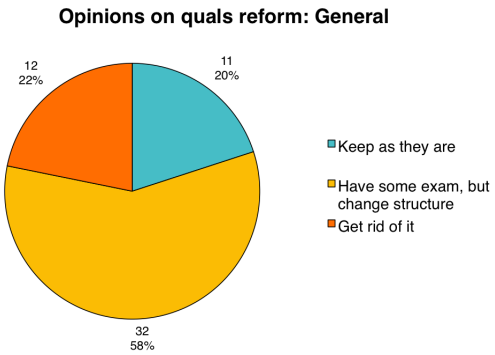
You can find quotes from respondents related to mental health in appendix A.

6 Proposed Changes

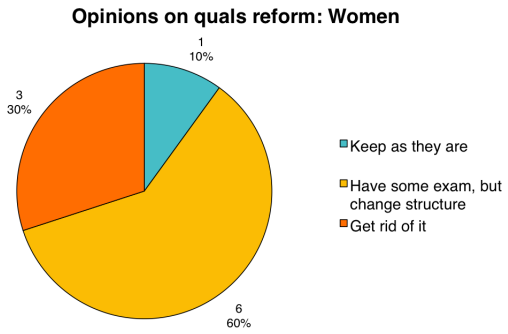
Based on how little the Columbia physics qualifying exam has changed in the last few decades, we proposed two minor changes that we believe faculty could be compelled to implement. Please note that this does not mean that we think changes should stick solely to these proposals. We do believe that a much bigger reform of quals should follow. In fact, the vast majority of students across all demographic groups believe that the structure of quals is outdated and should change, as seen in figure 5. 7 out of the 11 students who think quals should remain the same are international, meaning they likely come from cultures heavily focused on exam taking for assessment. Almost a quarter of students and a third of the women think that quals should be abolished altogether. Hence, we urge faculty to consider reforming the qualifying exams.

In face of the urgency of quals reform, we proposed two minor changes to start with. The first one was to reduce the load of exams from 6 to 4, given how arbitrary certain questions can be on the applied quantum/relativity and general topics sections, as well as how fatiguing taking 6 fast-paced exams in a week can be. We proposed that the new sections would be classical mechanics, electromagnetism, quantum mechanics, and statistical mechanics. If necessary, a couple of relativity questions could be included in the classical mechanics section. Sections should continue to allow students to skip at least one question or potentially have 6 questions and allow for 2 questions to be skipped (the latter is currently done for the statistical mechanics and various topics sections), given that the topics would be condensed into fewer exams.

The majority of students (75%) either agreed with the proposal or did not have a strong



(a) General Student Body



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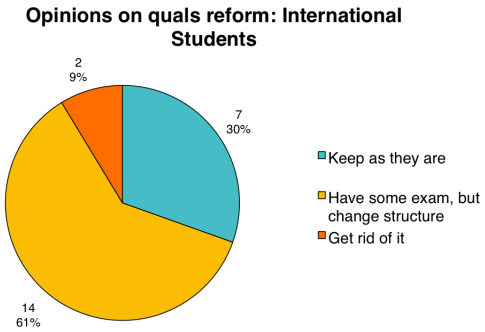
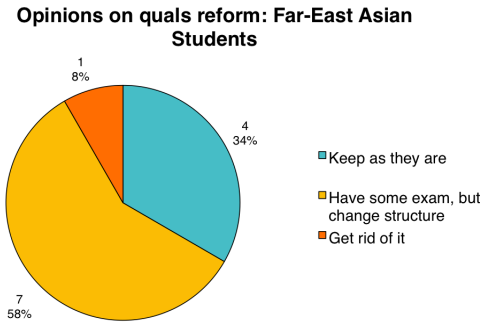
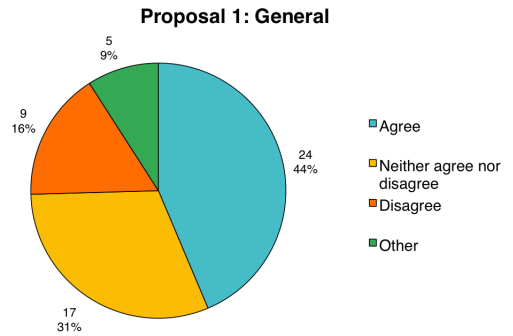


(c) International Students



(d) Far-East Asian Students

Figure 5: We questioned students on how they felt about the current exam structure. The majority of students in every demographic group was in favor of reforming our qualifying exams as opposed to keeping them the way they are. Interestingly enough, 5 of the 12 people in favor of getting rid of quals altogether were either women or in racial minorities.



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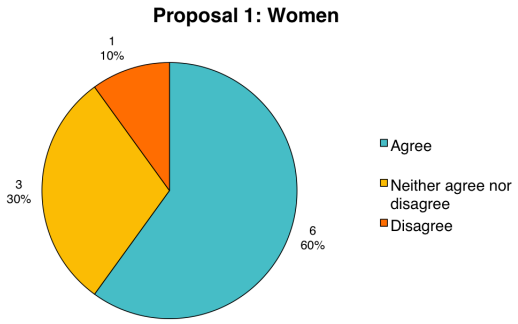

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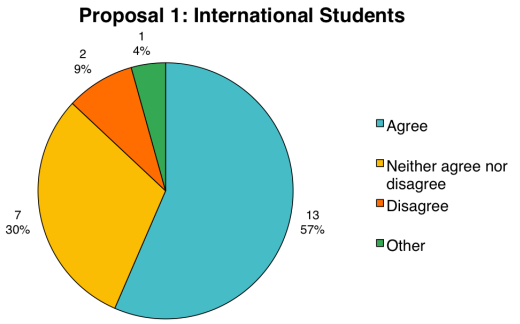

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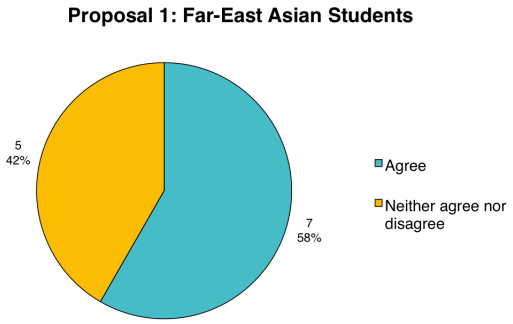
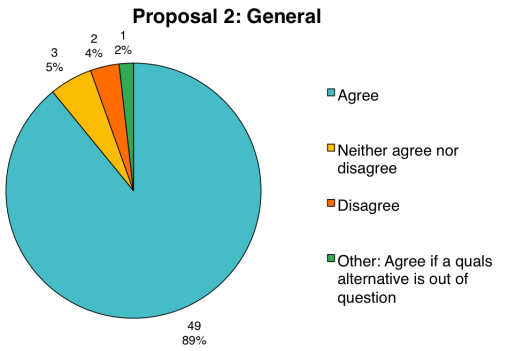


(d) Far-East Asian Students

Figure 6: Proposal 1: Reducing the number of written exams from 6 to 4, potentially including relativity in the classical mechanics and E&M sections. The sections would then be classical mechanics, E&M, quantum mechanics and statistical mechanics. While there were differences among the responses from different demographic groups, most students said they either agreed or didn't have a strong opinion about it. The majority of women, the only underrepresented group we had a considerable sample size of, responded to be in favor of this change.

opinion about it, as seen in figure 6.

Our second proposal was to allow students not to retake sections that they already passed in their first trial. Currently, if you fail a section, you have to retake both sections from that particular day. If you fail 2 or more sections on different days, you have to retake the entire exam again. The current system is not only unfair, but also leads to more stress and anxiety around an exam that is supposed to serve solely as a diagnostic tool. Students overwhelmingly agreed with this proposal (figure 7).



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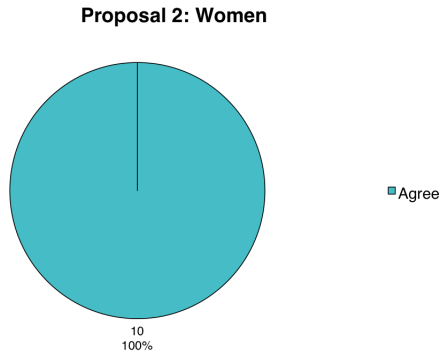

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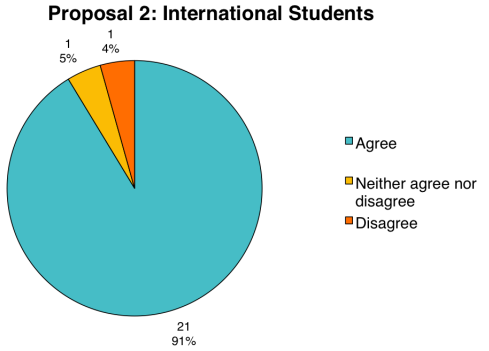

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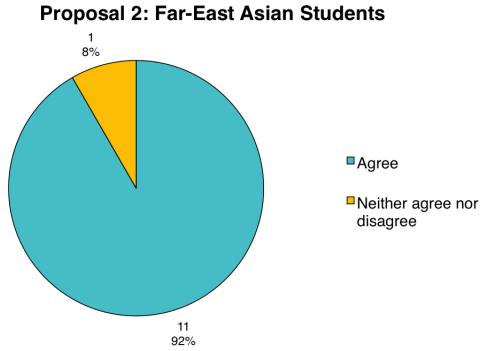

(d) Far-East Asian Students

Figure 7: Proposal 2: Students would only have to retake sections that they did not pass the first time. As of now, if you fail a section, you have to retake both exams from that particular day; if you fail two sections on separate days or more than two sections overall, you have to retake the entire qualifying exam. This proposal got overwhelming support from every demographic group in the student body.

7 Examples from Peer Institutions

7.1 Written Qualifying Exams with Only Four Sections

The following peer institutions have written qualifying exams with the equivalent of four Columbia exam sections.

- Massachusetts Institute of Technology
- California Institute of Technology
- Princeton University
- University of Michigan
- University of California - Los Angeles

Each section takes between 75-120 minutes to complete. In addition, MIT graduate students can instead opt to pass a corresponding graduate course. Each institution's sections mostly correspond to classical mechanics, electromagnetism, quantum mechanic, and statistical mechanics.

7.2 No Written Qualifying Exam

The following peer institutions have no written qualifying exams. Instead, they only have an oral exam that includes a presentation on a topic in their field, and may also include a written report related to their presentation.

- Stanford University
- Harvard University
- University of Chicago
- University of California - Santa Barbara
- Duke University
- New York University

These institutions generally consider passing required courses to constitute sufficient breadth of knowledge in core physics subjects.

7.3 Massachusetts Institute of Technology

The MIT physics department has a written qualifying exam consisting of four 75 minute exams covering electromagnetism, classical mechanics, statistical mechanics, and quantum mechanics. However, students can instead opt to pass the corresponding graduate course. If they fail any of their written exams, they must pass the corresponding course. Students are required to complete the requirements for the written exam by the January of their second year.

Students are also asked to do an oral exam to be finished by the first term of their third year. It consists of a series of questions broadly related to the student's field, and concludes with questions on the student's research.

7.4 Stanford University

The Stanford physics department does not have a written qualifying exam. Instead, Stanford has an oral examination to be completed by the end of their second year. The oral exam consists of a 45 minute presentation on a topic different from the student's dissertation topic, followed by additional questions from faculty members about their specific topic and about the greater subfield.

7.5 California Institute of Technology

The Caltech physics department has a written qualifying exam consisting of two 3 hour exams covering classical mechanics, electromagnetism, quantum mechanics, and statistical mechanics. Students are required to complete the exam by the end of their second year.

Students are also asked to do an oral exam to be completed by the end of their third year. It consists of a 45 minute presentation on the student's research topic, with 45 minutes of questions about the topic mixed in.

7.6 Harvard University

The Harvard physics department does not have a written qualifying exam. Instead, Harvard has an oral examination to be completed by the end of their third year. The oral exam consists of a 40 minute presentation on the student's proposed dissertation topic, followed by additional questions from faculty members about their specific topic and about the greater subfield.

7.7 Princeton University

The Princeton physics department has a written qualifying exam (called the preliminary exam) consisting of four 90 minute exams covering classical mechanics, electromagnetism,

quantum mechanics, and statistical mechanics. There doesn't seem to be a hard deadline to pass it, but students are encouraged to have their first attempt the January or May of their first year.

Students are also asked to do an oral exam to be completed by the October of their second year. It consists of a written report and a 15 minute presentation on an experiment that the student performed as a graduate student in Princeton, followed by additional questions from faculty members about topics in the report.

7.8 University of California - Berkeley

The UC Berkeley physics department has a written qualifying exam very similar to Columbia's. It consists of four 3-hour sections. However, students do not have to retake sections they have already passed, and failing to pass every section does not automatically bar a student from candidacy. Students are required to complete the exam by the end of their third semester, and are encouraged to start during their first semester. If a student does not pass a section by the third semester, they will be asked to pass a course corresponding to that section.

Students are also asked to do an oral exam by the end of their fourth year, but are encouraged to do it two to three semesters after finding a research advisor. It consists of a 45 minute presentation on the student's proposed dissertation topic, followed by additional questions from faculty members about their specific topic and about three fields related to this topic.

7.9 University of Chicago

The UChicago physics department does not have a written qualifying exam. Instead, they offer an optional diagnostic exam which will allow students to pass out of required introductory courses.

7.10 University of California - Santa Barbara

The UCSB physics department does not have a written qualifying exam. Instead, UCSB has an oral examination to be completed by the end of the Winter quarter of their third year. The oral exam consists of a 30 minute presentation, of which at least 10 minutes must be about the review about their field, and the rest on the student's proposed dissertation topic.

7.11 University of Michigan

The UMich physics department has one 5-hour written qualifying exam (which was recently reformed from being two 5-hour exams) on classical physics (classical mechanics and

electromagnetism) and on modern physics (quantum mechanics and statistical mechanics). Students are required to complete the exam by the beginning of their third year.

Students are also asked to do an oral exam (called the preliminary exam) by an unspecified time. It consists of a ∼40 minute presentation on preliminary research findings, in the style of a thesis defense.

7.12 University of California - Los Angeles

The UCLA physics department has a written qualifying exam (called the comprehensive exam) consisting of two 4-hour sections, which is equivalent to four sections on the Columbia qualifying exams. It covers six core courses (electromagnetism 1 & 2, classical mechanics, statistical physics, and quantum mechanics 1 & 2). Students are allowed two attempts, the first of which can be any time by the fourth quarter of their first year.

Students are also asked to do an oral exam by their 9th quarter. It consists of a 30 minute presentation on the student's proposed dissertation topic, followedby additional questions from faculty members about their specific topic

7.13 Duke University

The Duke physics department does not have a written qualifying exam. Instead, Duke has a preliminary examination to be completed by the end of the Winter quarter of their third year. The preliminary exam consists of a 4-8 page report, a 30-40 minute presentation, followed by additional questions from faculty members about their specific topic and about the greater subfield.

7.14 New York University

The NYU physics department does not have a written qualifying exam. Instead, they offer an optional diagnostic exam (called the preliminary exam) which will allow students to pass out of required introductory courses.

8 Conclusion

After analysing the results of our survey, it is clear to us that there is an urgent need for reform. This is evidenced, for instance, by the fact that women seem to be disproportionately affected by the exam, as seen in sections 3 and 5, which is in diametrical opposition to the desire of the department to diversify its student body. Women reported hesitating to accept Columbia's offer because of quals at a percentage rate 20 times higher than men's. Unfortunately, we did not have enough data from students in racial minority groups, largely due to the Columbia physics department demographics.

Additionally, there is a large gap between acceptance of our current exam between international and domestic students. International students reported studying less in preparation for the exam (see section 2), which is likely a consequence of other countries focusing their assessment mostly on exam taking. Also, domestic students were more likely to want our quals to go through much needed reform (see section 6).

Almost half of the students surveyed mentioned incredible stress, seeking counseling, or disrupted eating/sleeping habits related to studying for the qualifying exams. There is very little benefit in the current format of the qualifying exams considering the fact that other universities have systems that achieve the same goal with less impact on students.

Columbia's qualifying exam remains an outlier among its peer institutions. Even at UC Berkeley, whose written qualifying exam is most similar to Columbia's, students who fail a section of the exam on their second attempt are usually asked to instead pass a course related to that section. If the goal of the qualifying exam is to ensure that our students do not have gaps in their undergraduate-level physics knowledge, then we should aim to treat the qualifying exam as a diagnostic exam instead. Ideally, the written qualifying exam should match that of Massachusetts Institute of Technology, that of the University of Chicago, or that of New York University, in which the exam is optional and serves as a diagnostic tool.

In addition, the focus of the qualifying exam should shift more to aid students in their research progress, which is after all the main goal of a Ph.D. program. The majority of our peer institutions have an oral exam which mainly consists of a presentation, either on the student's research topic or on a related topic in their field. This presentation may also include a written report and/or answering questions about their field. The benefit is that students become more knowledgeable about their field, are better prepared to defend their thesis, and start thinking about their long-term goals from the start of the program.

In fact, students overwhelmingly support changing our qualifying exams (see section 6), which has remained mostly the same for decades, and think that there are more effective ways to review undergraduate-level material (see section 4). Students supported condensing the current 6 sections into 4, essentially eliminating sections 4 (applied quantum mechanics and relativity) and 6 (various topics) of our current exam and including a couple of relativity questions into the classical mechanics exam. There was very strong support for only making students retake sections that did not pass on their first attempt. Further reform would still be needed, but we believe those are concrete small steps that the department can take in the right direction.

A Appendix: Mental Health Impact Quotes

Here are the answers we got to the following question: "Optional question: How did you feel mentally and physically in your first semester during your preparation leading to quals and while taking the exams? Please elaborate on any factors that could have made quals

more difficult for you, if you felt prepared, or whether you sought counseling or medical help during the process as long as you feel comfortable sharing this type of information. If you want to share your experience with it, but don't want your words shared with the department administration, just state that and we will honor your request."

> I felt pretty miserable, and I had to go to therapy and start taking medication to cope with my first-semester, even though I consider myself to be a person who deals with pressure reasonably well. Your first-semester of grad school can be soul-crushing. Some people are living away from home for the first time or have family issues to cope with far from home, others are going through breakups, people might not be adjusting to NYC or to their living situation (especially with randomly matched roommates and Columbia apartments that get no sunlight), taking multiple classes (and some people might not have come straight from undergrad and have to get into that mode again) including Christ's quantum mechanics (which is a full-time job in itself), trying to find an advisor, teaching and grading loads of exams, etc. The department does not provide a support and advising system to help students navigate their first year (or any year) of the program, so that can feel like a lot to handle at once, especially since your first semester, when you don't know anyone around, is particularly isolating. I had to face most of those problems at once, and was having breakdowns almost every day, sleeping very poorly, and feeling physically and mentally exhausted throughout the day. The pressure that quals added to all of it was absurd. Just knowing that I wouldn't have a break after my first semester, finals, and exam grading, and wouldn't be able to see my family and friends for an entire year as a consequence (since I need to stay in NYC to focus on studying during winter break, given that we don't have time during the semester) made me feel miserable. It's particularly worse for international students like myself. Going through winter break was even worse. While taking the exams, I felt physically exhausted and had headaches after every single exam. I just don't understand why this process needs to be so brutal when there are clear ways of achieving the same goals without the excessive stress.

> Incredibly stressed. I had my first panic attack in preparation for quals and it was not pleasant or particularly conducive to learning. It pushed me to finally see a therapist, which was admittedly long overdue. I had not done particularly well on the Physics GRE (having been admitted under other circumstances) so I was told early on by Mawhinney that I would have an especially difficult time with quals. This forewarning did not help. The trial-by-fire rite-of-passage attitude

underlying discussion of the quals by certain senior faculty is really toxic. It does not jive well with my depression at all. The non-physics skills tested by the quals are particularly bad for neurodivergent folks and I'm sure contributes to the stunning lack of diversity in the program. I had an incredibly bad time with the whole ordeal and I feel that it makes the department a less healthy and less inclusive place.

I sought counseling in the fall semester and during the break. Stress and insecurity induced by quals were a primary (but not solitary) factor in my choice to seek counseling. I also sought a sleep aid to help with getting enough sleep in the weeks leading up to, and the week of quals. The experience of quals was one of the most unpleasant in my life, I have rarely experienced levels of stress that high. I did not feel prepared, and did not feel like there was any reasonable way I could ever have felt prepared, given how poorly defined the content of the qualifying exam is. Especially since there is no clearly defined threshold for passing quals, I found myself constantly comparing myself to others, which was incredibly detrimental to my emotional well being.

Felt mentally poor and physically worse in the winter leading up to quals. Eating/sleep/exercise/etc habits were impossible to maintain. The energy in the grad offices at this time was dismal. In the frequent discussions at that time about how terrible it was, it was mostly agreed that the worst part was a feeling that no matter how well we did as a class, at least one of us would fail. This was painful since we felt close and supportive of one another, were helping each other study etc. Maybe the premise is false but since there's zero transparency and we were given that impression by older students, it was what we mainly talked about.

Quals review sessions were quite stressful because many topics were brought up that were made to seem like all undergrads should have learned it, yet most of the first years did not learn about the material until the review sessions started. I feel like studying for quals after Fall was most stressful, as I spent many many hours per week just doing problems all day. Granted, I could have started earlier but Fall semester was already tough in terms of coursework and establishing a good work life balance.

It was very stressful for me, and for a long time I thought I definitely would not pass. Other (personal) factors that played a big role in increasing the stress level: I had a very hard time in my personal life the first semester. Also, I completely took off several months before joining the program, so I became unfamiliar with lots of the undergraduate materials.

The qualifying exam is an excellent target for latent fear/anxiety in the graduate student population. Mentally and physically my health was poor the first two years of graduate school in no small part due to the qualifying exam. I did not seek medical help or counseling during my preparation for the qualifying exam, though I should have.

I think coming to a new school, changing environment, moving to a new city/country is always stressful, and having this exam on top of all of that was making it even worse. I wish I had talked more to other people about how I was feeling or sought some sort of counseling, because I felt really behind everyone's else.

Studying for quals was extremely stressful during winter break - to the point where I did not spend time with family or friends. Though this decision was definitely my own, it resulted from the fact that no matter how much I studied, there was always something on an previous qualifying exam that I did not know.

Terrified, especially when compounded with Christ's Quantum and grading. Essentially I had no time to breathe after finals and enjoy my family time before I had to dive into Quals prep. Although, I probably could have prepared more for Quals during the fall of my 1st semester.

Actually in some ways the let-down afterwards was equally bad as the preparation in advance since I realized how little I'd gained from the experience relative to how much I'd invested.

B Appendix: Survey Questions

Hello fellow physics grad students!

In light of an upcoming quals town hall, the PGC would like to gather data on grad student student opinions regarding our department's qualifying exams. Quals have not really changed much in the past couple of decades, so this is your chance to make your voice heard, but also an opportunity to put feasible proposals on the table.

This survey is anonymous, unless you want to identify yourself at the end of it.

In this survey, you will be asked general questions about the time you took the exam. We will also have more specific proposals that you will have the opportunity to vote up or down, so we can at least try to have a targeted discussion on actionable items for the short term future of the exams. In the end, you'll also have a section to write your comments and examples of how quals are done at other places.

Thank you for your input! We're looking forward to reading your answers!

-The Physics Graduate Council

- **How did you prepare for quals?** (Multiple choice)
  - Mostly working on previous questions
  - Mostly reading/studying content on textbooks
  - Other
- **Who did you study with?** (Multiple choice)
  - Mostly by myself
  - Mostly in groups
  - Roughly half of the time by myself and the other half in a group
  - Other
- **How many hours did you spend per week on average DURING the FALL semester leading to quals studying for the exams?** (Numerical question)
- **How many hours did you spend per week on average DURING the WINTER BREAK leading to quals studying for the exams?** (Numerical question)
- **Were quals a consideration when you were choosing a graduate program?** (Multiple choice)
  - Yes, I hesitated to accept Columbia's offer because of quals
  - Yes, but it wasn't a big deal for me

  - Yes, I thought Columbia's quals were reasonable, which counted as a positive factor for Columbia
  - No, but I should have given more thought to it
  - No, quals weren't a consideration for me at all
  - Other

- **If you've ever considered leaving the physics program, were quals a consideration (Yes or no)? If yes, how so?** (Text answer)

- **Do you think quals were effective for you to review undergrad material?** (Multiple choice)
  - Yes
  - To some extent, but I think there were more effective ways to do that
  - No

- **Optional question: How did you feel mentally and physically in your first semester during your preparation leading to quals and while taking the exams? Please elaborate on any factors that could have made quals more difficult for you, if you felt prepared, or whether you sought counseling or medical help during the process as long as you feel comfortable sharing this type of information. If you want to share your experience with it, but don't want your words shared with the department administration, just state that and we will honor your request.** (Text question)

- **Do you think quals should keep quals the way they are currently?** (Multiple choice)
  - Yes, I think they work as they are now
  - No, we should have some form of examination, but the structure should change
  - No, we should get rid of quals completely

PGC Proposals for Short-Term Reform: In this section of the survey, you can vote up or down on proposals to start reforming quals, at least for the short-term.

- **Proposal 1: Condense exams from 6 to 4. The way this would be executed could still be up fo debate, but suggestions include folding exam 6 into 5, including applied physics questions in the quantum exam (exam 4) and folding relativity questions into day 1 exams (classical mechanics and E&M). We could also debate having 6 questions (2 to be skipped) in every exam**

to make them fairer as they incorporate more content. Ideally this would make the exam week less brutal mentally and physically on students and still test the same content. (Multiple choice)

  - I agree with the proposal
  - Neither agree nor disagree with the proposal
  - I disagree with the proposal

- **Proposal 2: If you pass a section, you don't have to retake it. The way quals are currently organized, if you fail 2 sections on different days, you have to retake the entire thing; if you fail one section, you have to retake an entire day of exams. With this proposal, any sections you do reasonably well on will not need to be retaken the following year.** (Multiple choice)

  - I agree with the proposal
  - Neither agree nor disagree with the proposal
  - I disagree with the proposal

General comments section: Please use the following questions to give us general comments or suggestions on anything related to quals.

- **Do you have general comments or suggestions about quals, this survey or any other related subject?** (Text question)
- **Do you have comments about other quals models employed (or not employed at all) by other schools that we should look into?** (Text question)

Demographics: The following two questions will be used to get a general sense of how different groups feel about quals, but no individual answer will be linked to what you say below. It is our priority to preserve your anonymity.

- **What year are you in the program?** (Multiple choice)

  - Year 1
  - Year 2
  - Year 3
  - Year 4
  - Year 5+
  - Prefer not to say

- **Do you identify with any of the groups below? Please select as many as you see applicable.** (Checkboxes)
  - Women
  - Gender non-binary
  - LGBTQ+
  - Black/African-American
  - Latino/a/x and/or hispanic
  - Far-East Asian
  - Racial or ethnic minority not listed above
  - Religious minority
  - Person with a physical disability
  - Person with a mental disability
  - International student
  - None of the above
  - Prefer not to say
  - Other
- **Optional: If you would like to disclose your identity, please write your name below.** (Text question)