

Student Expectations, Classroom Community, and Values Reported on Group Exams

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Group exams are an assessment technique that has been gaining traction in recent years. Group exams provide students with an environment that amplifies typical collaborative learning. We interviewed students who were taking group exams in physics classes to learn about how they report group exams influence their expectations of peers, their involvement in the classroom community, and their external values. Given the paradigm-changing nature of group exams, we find that experience is a key factor in these areas.

I. INTRODUCTION

The idea that students learn better in active and collaborative settings has been termed, by some, the “Standard Model of PER.” Indeed, evidence of this idea has been around for decades [1]. One of the ways that we can underscore the importance of interaction to our students is by assessing students collaboratively. One such method of collaborative assessment is group exams.

Group exams have been implemented in many places for many reasons. [Lin and Brookes](#) used group exams because they wanted students to “learn without being taught,” investigating ways that group exams could prepare students for future learning [2]. By design then, [Lin and Brookes](#) gave group assessments *before* individual assessments. [Wieman et al.](#) were interested in using group exams, in part, to underline the value of active/collaborative classes to their students [3]. As stated by [Gilley and Clarkston](#), group exams increase student learning in large part because they provide formative feedback to the exam-taker [4]. Following the model of peer instruction, they put the group exam *after* the individual exam because ideas must be elicited before they can be evaluated.

[Rieger and Heiner](#) have studied student attitudes on group exams before by administering a survey which revealed that a majority of students view group exams in a positive light [7]. [Rieger and Heiner](#) also found that many students claim that group exams provide immediate feedback and allow students a chance to observe new approaches to solving problems [7]. [Rieger and Heiner](#) also came to the conclusion that students found group exams to be “*helpful*” [7].

At East Carolina University some physics professors have been giving a two-stage exam in order to create a stronger sense of community in their classes. Exams are designed such that each student takes the same exam twice—first individually, then in a group [5, 6]. This prior work has focused on how social structures develop within the classroom community [6]. A key attribute of this format is that students were allowed to pick whom they work with in an environment which greatly encourages fluid and open collaboration [6]. This prior work has focused on self-reported data to generate social networks.

Group exams build on the collaborative environment created in the classroom, and allow it to flourish. Many authors have commented on how interactions are much more spirited during exam sessions [e.g., 3] making them an interesting

context to study student behavior, and we can report the same anecdotal observations in our classes. We have also been observing student behavior on group exams for some time now (Wolf has used group exams in his classroom since 2014, Sault is one of his former students and could comment from the perspective of a student taking a group exam). We have been curious about the ways that group exams change student behavior and structure the classroom community. More specifically we want to know:

- What expectations do students have for themselves and their group members on group exams?
- How do group exams encourage students to create an active and collaborative classroom community?
- What do students value about group exams from a skill-building and affective perspective?

II. PROJECT FRAMEWORK

In addition to having taken group exams using the duplicate exam format described above, students interviewed in this study also were in “lecture” sections utilizing a flipped pedagogy. Each class had about 45 students, and each class also had 3 LAs in addition to the instructor. LAs had not seen the exams prior to the group exam, and had not engaged with course faculty about them beforehand. Students knew this and LAs were free to discuss questions as they saw fit. Course faculty also discussed questions with students, and would provide guidance (e.g., prompting students to draw a free body diagram (FBD)), but not be explicit with feedback (e.g., suggesting how they should improve the FBD drawn). On non-exam days, some faculty set student groups, while others allowed students to freely choose groups. On group exam days, students were instructed simply to collaborate. Most of the time, they started with their regular groups, but students often worked with people outside of this group. Notably, students often wanted to change groups after an exam, leading to our desire to learn more about how group exams changed our classroom community.

A change in environment within an introductory physics course can alter student expectations of the class [8]. However, little is known about how group exams affect the expectations students have for one another and how these expectations shape the recognition of contribution from peers. In an effort to learn more about this we asked the students

what kind of expectations they have for themselves, and for their fellow students. We are also interested in finding out how group exams promote the amount of effort students put forth outside of the class. For example, do students study in groups more or less often when they know they will have group assessments? Next, we asked how much an anonymous peer would need to contribute in order to make you want to learn that person's name, and record that contribution to your exam. (Students are asked to record who they worked with on the group exam.)

We also want to know how changing the typical in-class culture of individual exams to include group exams affects the formation of an active community in a physics classroom. One of the most basic ways that we have for forming ties with people is simply learning and using their names. In fact, the ways that collaborations are recorded in other work relies on students knowing each others names [5, 6]. This prior work has noted changes in the classroom social structure over the course of a semester, and we are seeking to better understand those changes in this work.

A healthy classroom community is not simply one filled with students who are familiar with their peers; students need to take part in active scientific debate. Debate only occurs when there is disagreement, so we asked the students, *what do you do if your group disagrees on an answer during a group exam?* If group exams are to make a student more active in the physics community, we would expect them to argue with each other over the correct answer by providing evidence to support a claim and not simply sharing that claim. So in a healthy discussion, a student would say, "I got choice A because..." This would not only increase their value within the classroom community, but also increase their ability to think and communicate scientifically; a skill which is valued by many within the DBER, scientific, and professional communities. We continued to ask them about specific instances where they disagreed with their group, and asked how they managed to come to a consensus.

Finally, we are interested in how students value group exams outside of the immediate classroom, both for their future classes and career. A major goal of college is to prepare students for their careers, so we want to know if students see an increase in skill and knowledge transfer from taking group exams. For example, we want to see if students see group exams as a method of gaining communication skills and as a way to increase their ability to efficiently work in a team.

III. METHOD

One author (ETC) conducted interviews with four students, all of whom were enrolled in a (calc-based) university physics course and were STEM majors. Two of the students, Ethan and Heather, were in the midst of taking their first course which offered group exams. The remaining two, Abigail and Malcolm, were in their second such course. Two hours of video footage was gathered from these interviews. The au-

thor then began watching the videos and identified the major themes that were found in all four interviews, sharing videos with the rest of the authors at this time. Episodes were then categorized under the three key categories: student expectations on group exams, how group exams affect student involvement in the classroom community, and the external values students hold for group exams.

IV. RESULTS AND DISCUSSION

a. Expectations of Peers Our first area of study on group exams involves the type of expectations each student has for themselves as well as their peers, and how these expectations affect what they see as a meaningful contribution. We found that interviewees expected their peers to come prepared to contribute and participate at an appropriate level, and that the level of these expectations was shaped by prior experience.

Adequate participation had many levels. Each of the interviewees commented on this. For example, Heather noted that simply saying "*I got the same answer,*" would be appropriate some of the time. Heather's expectations for her group mates is for them to step forward when they have meaningful contributions to make as evidenced by her statement: "*[I expect t]hat if they have something to say, they say it. The same goes for me. Not necessarily have someone lead everything, not necessarily have everyone do their own individual thing, but like talk everything through. If you don't want to say something, then you shouldn't have to.*" Malcolm eschewed this idea of targeted participation, as evidenced by his statement, "*Really it's just kind of pull your weight, I guess... I feel like everyone has to be a really active member of the group.*" Being part of a group clearly means that each student should participate in the group discussion, even if they are unsure of their answers. Not participating would be viewed as free-loading, which is to be avoided. We can begin to see a pattern from the interviews: students who expect more from themselves also expect more from their peers. Broadening this finding to a larger population is the subject of future study. Ultimately, the students we interviewed do not care much about proficiency, instead they are looking for effort and communication from their colleagues.

Abigail also specifically commented on how expectations for peers can change over time. Her expectations for each group member changed based on her prior experience with her peers. When people fail to meet her expectations, she begins to expect less from them in future endeavors. If she has consistently worked with someone who has met and exceeded her expectations, then she will begin to expect more from that person in the future.

b. Community Formation Next we considered the classroom community, which was broken down into three components: argumentation, methods for handling disagreement, and recognition of others outside of the group. Not only did students expect others to contribute, but they were expected

to do so in ways consistent with the norms of civil scientific argumentation. For example, Malcolm expects group members to “*Just giv[e] your opinion, and of course [don’t] try to shove it down other people’s throats, be respectful. Kind of like ‘I got this, because that . . .’ instead of ‘it’s this, it’s this.’*” Similarly, Ethan found that group discussions helped sharpen his ideas about physics, “*We, like, all argued why one answer is better than another one. So people . . . contributed to my understanding.*”

In any situation where multiple people are coming together, there is bound to be disagreement. In a healthy classroom community, there will be multiple strategies for resolving this disagreement. Both Abigail’s and Malcolm’s groups take a systematic approach when dealing with the issue of internal conflicts during the group exam. They go around their table one by one, and each defend their answer until they come to a mutual consensus. Only in the case that they could not convince each other one way or the other would they outsource to other groups. However, when Heather’s group would run into a quandary they tended to immediately outsource to the professor, or to one of the roaming LAs for guidance. Only in the case that their group was not satisfied by the assistance provided by the teachers would they try to convince each other by looking for equations that back up their answers. Ethan’s group had a similar approach to Heather’s but they tended to outsource to their peers in other groups instead of to the instructional staff. It should be noted that the two students who were part of a group which used a systematic method were the two students which held the highest expectations from themselves and from their peers. These are also the students who have the most experience with group exams.

Sometimes a consensus is easy to reach, as pointed out when Malcolm recalled a time he disagreed with his group, “*All they did was draw it out and show me, it was like a two second explanation. [I said,] ‘Yes, you guys are right.’*” But sometimes gaining consensus requires a bit more work. For example, we asked Abigail to think of a time that her group mates were able to get her to change her answer on an exam and to tell us the type of evidence they had to provide to do so. She responded, “*I was thinking more along the mathematical lines of how the formula would look in my head, and they were thinking of it more conceptually and how it would [all] work together*”. Abigail mentions that she tends to think about things mathematically, and she finds that when her group mates provide her with a more *conceptual* way of looking at a problem they disagree over, she is more likely to change her answer to match theirs.

Taking group exams encourages students to debate with each other which should lead to an increase in familiarity with one’s peers. In a standard class, most students will only know the people they sit beside. So, they might only know a handful of their peers by the end of a course. We asked the students how many of their classmate’s names they knew, and they all knew at least 6-8 (out of 40) of their classmates by name. They know all of their group members, and a few people outside of their group. This leaves an interesting question

about recognizing contributions from outsiders: how much does someone have to contribute to a group exam for their shared ideas to be memorable?

Abigail stated that someone has to lead her down a thought process, which leads to an answer on at least one problem. It does not have to be the correct answer. Just being prepared enough to talk through the whole problem is sufficient to be recognized. Malcolm said that someone would need to work with him on at least “*three, four, or five questions out of twenty.*” So, one would have to help Malcolm with a minimum of 15-25% of the exam for him to recognize the contributions they made. One thing was common in all of our interviews, students saw collaboration in a black and white fashion. They view it as a binary choice of working with someone or not working with them, as opposed to collaboration being on a continuum.

Contribution recognition is not constant, it is dependent on the student. Students who take group exams know their classmates and use scientific debate to resolve internal conflicts with them while also communicating with their professors and LAs resulting in a tight-knit classroom community.

c. External Values The final thing we will look at is how students value group exams and what kind of skills students take from them. A vital aspect of college is its ability to prepare students for a career by building collaborative skills, in part by promoting communication outside of the classroom. We asked the students if they preferred studying in groups or alone, and if they studied with the same people they worked with on group exams. The conclusions were unanimous. Each student preferred studying in groups, and studied with the people they took the exams with. Ethan stated, “*Yeah. I always study with other people for all of my classes. That way I can teach them stuff, and they can teach me stuff.*” Malcolm had similar things to say, “*I find myself studying with groups more, and then going back on the whole group-think thing, it’s nice because when you study with a group you go ahead and get that exposure to different ways to look at it before you even take the individual portion.*” Later, he continued this thought, “*Yeah, that’s why I love groups, it’s just nice to be able to look at things differently.*” We can see another pattern beginning to form: students see value in viewing their peer’s perspectives. Malcolm coins the term *group-think* which is a recurring word he used throughout his interview, but it is also a theme that adequately describes how the other students feel they benefit from group exams. All of the students agree that getting views apart from their own on a problem is useful.

We asked the students whether they thought that group exams, or individual exams better prepared them for working in the real world. Malcolm responded, “*I would say the group. . . I think it teaches you how to group-think, and how to, you know, communicate in a group effectively to get the work done.*” It is clear that Malcolm believes that group exams are more efficient at preparing him for his future career than individual exams by helping him build skills that will transfer to collaborative situations in the workplace. Heather

goes one step further by saying, “Group exams. . . It definitely was an experience working everything out with people, I’ve never had to do that. . . Well I have had to do it sometimes, but not in a way that like, means something.” So, we can see that the students we interviewed believe group exams help build strong communication skills that will transfer to the real world, but Heather even goes as far as to say group exams have been her **only** exposure to working with peers on problems that she sees value in. The fact that Heather feels this way, even though she works with her group members and LAs every day in class, shows that she thinks collaborating on group exams provides a different experience than simply collaborating on in class problems.

Abigail agreed that she thinks working in groups helps prepare her for working in the real world. She continued to say that group exams decrease the amount of stress she experiences, which is good because high stress situations lead her to “overthink” problems. Next, she mentioned that receiving confirmation from her group mates, after taking the individual exam, would reassure her that she was on the right track. This promotes the idea that group exams provide an opportunity to receive formative feedback. Not only do the students gain a boost to their grade by learning the material during the group portion (even if they got the incorrect answer during the individual portion), they gain confidence through interactions with their peers, and in some cases have reduced levels of stress associated with exams.

We can see that students find that they gain valuable skills from group exams, even more so than working in groups on in class assignments and for some, group exams even decrease the amount of stress in their lives. They find that working with others in and out of the classroom benefits them by building their skills in communication and teamwork.

V. CONCLUSIONS

Group exams influence student’s behavior in many ways. We considered the different ways group exams influence student expectations, interactions with the classroom community, and values held outside of the classroom. We found

that students familiar with group exams responded differently than their peers who were less familiar with group exams.

Student’s expectations for each other are dynamic. If expectations are met and exceeded, they will be higher for future interactions with peers. Conversely, if expectations are not met, they will be lowered. Those who had a systematic approach to dealing with in-group disagreements held the highest expectations of themselves and their peers. Ultimately, students expect their peers to come to the group exams prepared and willing to discuss each question. They do not typically require high levels of expertise, but they do value exertion and do not tolerate free-loading.

We found that the way students recognize peers is not the same. Some only require a statement of agreement on a problem to recognize a peer’s contribution, while others necessitate scientific discussion on multiple problems. Group exams provide an environment that promotes familiarity and civil scientific debate among students. This, along with providing students an opportunity to outsource to their instructors builds a strong classroom community.

Echoing and building on the observations of [Rieger and Heiner](#), we found that students value getting different perspectives on problems, and group exams provide this along with immediate feedback. Group exams build student’s collaborative skills like being able to *group think* which students believe will transfer to the in future careers. Students also believe that group exams help better prepare them for their careers than individual exams and in some cases they can even diminish stress.

In the future we want to study how different instructor choices affect different aspects of student behavior on group exams. For example, at the time we conducted our interviews the students were unable to specifically replicate the grading criteria for their group exams. An unintended consequence of the interviews was that some students asked more about the grading system which led them to exploit loopholes in the grading scheme. We also want to take a more in depth look into the kinds of evidence that is required to cause claim change on group exams and how this shifts with a student’s expectations of their peers. Finally, we need to further explore the relationship between gaining collaboration skills and students perceived future career benefit.

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