Designed for Learning Ep13 Transcript

Using Two-Stage Exams to Promote Active Learning in Large Classes (January 8, 2026)

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[JIM LANG]
(cheerful upbeat music)
Welcome to *Designed for Learning*, a podcast from Notre Dame Learning. I'm your host, Jim Lang. For decades now, the call to college teachers has been to incorporate more active learning into the classroom instead of relying primarily on lectures. Active learning might take the form of discussions, small-group brainstorming, think-pair shares, and more. Strategies like those fit well into smaller courses. We can keep a handle on the chaos that sometimes can erupt when lots of voices are sounding in the room. One challenge for active learning proponents has always been the large class. An instructor teaching chemistry to 300 students in an auditorium won't be able to hold a discussion in which everyone can participate. So in large classes with lots of students to educate and manage, how do we encourage more participation and community, which are two key goals of active learning? Today I'm excited to talk with a professor who's not only found a way, but who also has written a guide that will help other teachers navigate the logistics of bringing more active learning into classes of any size.

Dr. Rachel Branco is a neuroscientist and associate teaching professor at the University of Notre Dame, where she teaches courses related to neuroscience and biochemistry. Rachel is passionate about researching and implementing practical classroom strategies that improve how students learn about and experience science.

Welcome to *Designed for Learning*, Rachel.

[RACHEL BRANCO]
Great. Thank you so much for having me. I'm happy to be here.

[JIM LANG]

All right. Let's start by setting the scene. Tell me about the course you teach, the number of students, the setup of the room, and the primary challenges that you face as someone who teaches a large STEM course.

[RACHEL BRANCO]

Yeah. So I teach a mix of classes, some smaller, like 30-person upper-level elective classes, but a lot of what are called service-level classes, where this is in the range of 100 to 200, sometimes getting up to 300-person classes in a large lecture hall that are quite content-heavy classes. There's a high expectation of how much content must be delivered to the students over the semester. And in my case, they're primarily about issues in science, so biochemistry and neuroscience.

[JIM LANG]
And so teaching these big classes, the first time you did this, what were the main challenges that you faced as a teacher of a large class?

[RACHEL BRANCO]
Yeah. Well, the main challenges are, anyone creating a new class or getting involved in a new class, the instructor has to get comfortable with material and come to terms with how they're going to deliver that material. But fundamentally, I really struggled with how to invite the students into the process of learning in a large class. In smaller classes, I felt much more able and nimble to speak to students' interests, to get to know them individually, to invite them into thinking about difficult questions. And I found that I had to be much more purposeful in how I produced those similar effects in my large-enrollment classes.

[JIM LANG]
So you had to find some new strategy to create those kinds of effects that you wanted as a teacher and for your students. So tell me about your strategy that you've sort of discovered, or that you've hit upon, to help students talk to each other, learn from each other around the process of taking their exams, which is a surprising way to do this. So how'd you discover this process, and what does it look like in your classroom?

[RACHEL BRANCO]
Yes. I'm a big proponent of what are called two-stage exams. They're sometime called collaborate exams or quasi-group exams. And I wish I could tell you that I discovered it or that I've had some huge breakthrough around these two-stage exams, but I'll be honest, I was just looking for a solution to some of my issues about active learning and involvement in the classroom and I stumbled upon it. I was at a get-together, just a casual get-together in a friend's backyard in Atlanta, where it was just people interested in teaching and science teaching. And I overheard over the fire pit someone talking about this concept of two-stage exams. She wasn't even talking to me. I just listened in and I was like, Oh, that's interesting.

And then later when I started teaching here at Notre Dame, in my upper-level elective classes, I started putting into practice this two-stage exam. So in general, what is a two-stage exam? It's an exam in which students come into an exam period, and they take the exam once individually, just like a traditional exam, then they submit their answers for the individual portion of their test, and then they take the exact same exam again a second time in a group. So with the benefit of that group collaboration, they are retaking the same exam. And then their total grade

for that exam is a combination of their individual score and their group score, normally weighted around 80 percent to 20 percent.

So I started to do this, and I did this for a few semesters in my upper-level electives. I loved it. The students were into it. The students really enjoyed it. I liked it. And I can talk about what it really added to it. But then I was like, I want to do this in my large science classes; I think this would really be a benefit to the students and offset some of the problems and challenges of incorporating active learning into the classroom to transform the assessment experience into also having a learning component to it.

And that's when I feel like my rubber really started to hit the road because then you have to answer, How are you going to facilitate this in a class of 250 people where you can't just call out, Marsha, Joe, and Rahul, you guys sit together and do this as a group. You really need some logistical planning to help it work smoothly. And so that's what I've been working on over the past few semesters and recently have written up in an implementation guide article.

[JIM LANG]
This technique was born in a small class, but then you sort of transferred it into these larger classes.

[RACHEL BRANCO]
Well, I will say for me, I got comfort with the technique and really felt validated and excited about the possibilities of using two-stage exams in my smaller classes, and that gave me the confidence to try it in larger classes. That being said, the two-stage exam has been around since the '90s, so many other people have tried it. Don't be like me, where I was like, I'm going to figure out this two-stage exam technique, and I'm not going to look up anything, and I'm just going to figure out what I need to do to make it work. So to be honest, I made quite a lot of mistakes. And so in writing this implementation guide, I'm writing up what I wish I had known earlier in how to make this work for large classes to ensure that it can run smoothly. So I was maybe a little foolish in that I didn't trust or I didn't think to look up prior scholarship, but I don't need to reinvent the wheel here. There are best practices to make sure that this can work well in your classroom.

[JIM LANG]
When you actually saw that research, what did it say in terms of why this was a good practice? What did it accomplish having students doing that, this kind of two-stage exam?

[RACHEL BRANCO]
So there are quite a few really well-established advantages to using a two-stage exam. The top line one is that it improves student long-term retention of material. And this has been shown over and over and dozens of times in many studies, in many different contexts. And that's wonderful, right? As an instructor, that's our goal is how can we promote student learning? And the mechanism by which that's happening is thinking about the immediacy of the feedback. By

taking the group exam, right after taking the individual exam, they're immediately having to rehash their justification for that material and then being corrected by their peers in real time. So that's really great.

Besides the learning outcome advantages, though, there are experiential outcomes related to how the student is experiencing the exam that can be really nice. So students quite like it. Just right off the bat, students like it. They feel like it gives a nice bump to their grade. They feel more connected to their peers in the classroom. They feel like it's a chance to make friends. It also promotes a classroom culture where you don't know who your future groupmate is going to be. You don't know if someone else could be helping you in the future. So it promotes a culture of collaboration within the classroom.

It also increases motivation to study. This is tied to the social performance of the group exam. Students don't want to look like a fool in front of their peers. They don't want to be the weakest link. And so when students study, my survey results show that they're not studying just in a way that they can recall the material and perform well on the exam; they're studying in a way that they can recall the material and articulate and justify their answer because they know that that's going to be a built-in part of the assessment. So I think that motivation to study is quite nice.

I've also seen in some of my survey data that students have a reduced temptation for academic dishonesty, and students did not elaborate much on their attitude towards academic dishonesty in my open-ended survey questions, but I think it's tied to this idea that you are going to have to perform in real time in front of your peers. So if you copy exams or whatever you do that's maybe not academically the most up to snuff, you're going to have this backstop of you're going to have two other group members asking you why you picked the answer you did.

There are also mixed results about the student experience of exam stress, but overall the two-stage exam can be helpful for the student experience of exam stress. Particularly, it helps the feeling of stress after the exam. My survey data shows that the clarity that they feel like they have after the exam, they really appreciate it, and that helps them feel more calm in that post-exam period, that they already got it out whether they did well or whether they did poorly, they feel like they at least have clarity and they know where they stand because they've already rehashed their answers in the group portion of the exam.

So the benefits so far that I've talked about—improved student long-term retention of material, these student experiential outcomes that can be really quite helpful—I would argue a third way to think about the advantages is that it more closely aligns what we think about the goals of education with the assessment strategy. So at least in my field in science, we're not asking scientists to fill out a multiple-choice test when they are acting as a scientist. When someone is acting as a scientist, they have to be able to talk about science. They have to be able to think flexibly about it and articulate it and work well in a team. And I quite like that with this assessment strategy, I am directly incentivizing those skills.

[JIM LANG]
That's awesome. And I think what I'm hearing from you is that the rundown of these benefits are coming from, first of all, the research. Secondly, your anecdotal classroom experience. And then finally, the survey that you've done. So you have all these ways that are supporting this idea of these exams.

[RACHEL BRANCO]
Yes. Yes. And my survey corroborates the past research showing the improved long-term retention of material. That's wonderful. And a lot of the research, particularly about that learning outcome, shows that it can be particularly beneficial for students that are overall poorly performing or that are coming from less-represented groups. So I think it can particularly bolster students that might be weaker for whatever reason. And then it also—understanding the student experience of the exam helps inform how you actually implement it. So the way that I talk about it in class, the way that I talk about a growth mindset, the way that I justify why we're doing active learning practices during class is because—and this is very important to the students—this is ultimately part of their assessment to be able to talk about it. And thus it makes sense that we're doing more active learning throughout the class as a whole.

[JIM LANG]
Yeah. That's great. So [what] I promised in the episode overview at the start was that we're talking about logistics. I want to ask some logistical questions about this process. And ideally, people listening to the episode might have a stake in large classes, so let's walk through some of these things that might be hard for them to think about putting something like this in practice in a large class.

[RACHEL BRANCO]
Okay. So when I started thinking about how I was going to implement this two-stage exam, it's the logistics are the biggest burden about how you're going to make this work for your large group of students. And there are a few key things that I have implemented that I think are critical for success in doing a two-stage exam with a large class.

One is getting a seating plan. I think students should know exactly where they're going to sit before they walk into the exam room. So if your exam room has assigned seats or has seat numbers, then I go into that exam room, I take note of all the seat numbers where I want the groups to be, and then I add that to my organizational spreadsheet, and I can assign each group to which seats correspond in that group. When I have an exam room that does not have seat numbers in it, I use restaurant-style cardholders to make a little card that has that group number on it. And I also create a map of the room that shows where each of those group numbers are. So when a student walks into that classroom, they both see a map on the board saying where each group number is, and they see these restaurant-style cardholders showing the location of each of those groups.

I also think to be successful, you have to have all of the exam materials printed and ready to go on the students' desks. So set it out ahead of time. I use three exam documents. So the question booklet with all of the questions—and this is where students write their notes and scribble things and circle what they think are the right answers—and then an answer sheet for the individual portion of the exam, and then an answer sheet for the group portion exam. So they're those three documents, the question booklet, individual answer sheet, group answer sheet. And all three of those are ready to go in their seat when they walk into the room.

Another tip I've learned over time is to make those three different documents different colors. The two answer sheets I think should be brightly colored, particularly that individual exam answer sheet, it's got to be a bright color because when you're trying to rapidly collect all of the individual answer sheets at the end of the individual portion of the exam, it's so much easier to just do a quick visual scan of the room and look for anything bright green and go grab it than it is in a sea of white paper. So that really can facilitate the transition between the individual and the group portion of the exam.

And then my last major technological tool that I use is a mail merge software so that I can send emails out to students a day or two before the exam, telling them where they're going to sit so that they know that ahead of time. And then I should say one other software tool is on the grading side, I use grading assistant software. I use Gradescope. I'm a huge, huge fan of Gradescope. It makes things go so much faster. And because of the increased grading burden of this type of assessment strategy, something like Gradescope is really invaluable to speed that up.

[JIM LANG]
How have the groups formed?

[RACHEL BRANCO]
Okay. Well, yeah, so just big-picture thinking about how this works in a large class. I just want to set the scene because this is me, my 250-person biochem class, and students come in on an exam day, they're stressed. You don't want them thinking, oh, where do I put my backpack? Where do I sit? You want their exam experience to be as smooth as possible so that they can just focus on the task at hand, them demonstrating their biochemistry knowledge. And from an instructor standpoint, I'm like, how the heck am I going to do this? I have this big old classroom. I got these bunch of students. I got some students doing makeup, some students doing accommodations. How am I going to facilitate these groups so that students feel empowered to know where they stand, and they know what this experience is going to be like?

So how do I form the groups? I am a big fan of a random group. The research shows that random is the best way to mix up groups unless you're a class in which students have stable groups that are formed and used throughout the entire semester, which is almost never the case in a large class. So in a large class, in the absence of these sustained semester-long group projects, I think random is the way to go. So this gives you a good mix of students. You want

there to be a decent mix, and random gives you the best chance of getting that given that you don't have the information about student performance before the first exam. And truthfully, in a large class, even if you did have information about student performance before the first exam, that's just a whole bunch of rigmarole to try to annotate that and try to make optimal groups for everyone. So I think random gets at the advantages and is so, so much easier.

So what I do, I make a spreadsheet. In one column, I have all the student names. In another column, I use the random number generator function, and I assign a random number. I sort that random number by ascending to descending or in ascending order. And then the first three students are in group one, the second three students are in group two, and so on and so forth. And then I mix up the groups for every single exam because if a student does happen to have a group that was not a great experience for them for whatever reason, the next exam, maybe it'll go better. So as long as you can keep mixing up and using a random function, then you're also maintaining equity of opportunity.

[JIM LANG]
And how many students in a group?

[RACHEL BRANCO]
I do three. The research that I've looked up shows that three to four is the best number. If you have two, then if someone's sick or late or just a really bad group member, then you got a problem. If you have five or more, then you really start to see lack of group involvement. In five or more, students really start to have trouble every person having a voice. So I do three. I think three or four is the sweet spot.

[JIM LANG]
Okay. So give me a sense of how much time each part of the exam takes. So 75-minute class or whatever it is, what percentage is the individual and what is group?

[RACHEL BRANCO]
Yeah, so my exam period is 75 minutes long. I do 50 minutes on the individual exam, collect all of the individual exam answer sheets—they can keep their question booklet, but I get all the answer sheets—and then 25 minutes on the group portion. And it’s so fun when you say, after you've collected all the individual answer sheets, you say, introduce yourself to your new best friends, you can start talking about it and take it as a group exam, and the room just explodes with conversation. It is so much fun.

That ratio seems about right. I would not shorten the individual portion of the exam. I used to do 45 minutes on the individual, 30 on the group, and students didn't like that. I changed it to 50, 25. I might even go 55, 20 because students know that most of their grade is coming from the individual portion of the exam, and they want the chance to really think about that part. I found that the group portion of the exam, it goes much faster. Students have already thought

about every question, so it's just giving them an opportunity to hash it out with their groupmates.

[JIM LANG]
One more question about logistics, which is how much does each part count for in terms of exam grade?

[RACHEL BRANCO]
Yeah. I do an 80 percent, 20 percent split. Within the literature, there's a mix. It probably ranges between 75 percent and 90 percent accounted for the individual performance and then 25 percent to 10 percent on the group performance. And that can really be up to the instructor about—because the group exam is always better. The class average of the group exam is always better than the individual.

[JIM LANG]
Yeah, of course. Of course.

[RACHEL BRANCO]
So perhaps you might want to shift that depending on how much of a little grade bump do you actually want it to be. Truthfully, I don't think it matters much. I use an 80/20. The group portion is always around 10 percentage points higher than the individual portion. So that means that their calculated grade is two-and-a-half percentage points higher on average than it would be without the inclusion of that group portion. I just make my exams a little harder. I just do more analysis-based questions. So it's a manageable increase in the student grades.

And one tip I've learned to manage how I do that weighting between the individual and the group portion is to assign it within the point value. So rather than having to multiply an exam by a constant, just say the individual exam is 80 points, there are 80 points on that rubric, the group exam is 20 points, there are 20 points on that rubric. When you do an 80/20 split, it becomes really easy because you can just take your individual exam rubric and divide everything by four, and now you have your group exam rubric. So mathematically, that can be a lot easier. And then it syncs to your learning management system much more elegantly if you can just have that ratio embedded within the rubric itself.

[JIM LANG]
It sounds great when, as you say, the room explodes with voices and noise, which sounds great in some ways. In other ways, not so much. It could be, again, a lot of chaos in there. But let's talk about the positive part first. As you're walking around and you're hearing all these voices, what do you hear? What are students—are they arguing with each other? Are they trying to—what do they say to each other? What do you hear?

[RACHEL BRANCO]

Yeah. And it's funny you say that, whether it's a good thing or a bad thing for this cacophony of student engagement. It is kind of funny, especially when you're in a large lecture classroom. One of the early times I was doing this, the chair of my department happened to be walking outside of my classroom right when I introduced the group portion of the exam, and he came in and, What's going on in here, Rachel? (laughs) But I told him, Oh, we're doing this two-stage exam. He's like, You know what? That sounds amazing. That's great. I can't wait to hear how this goes. I'm like, Oh, phew, okay, thank goodness. But yes, students are talking things out. They are often arguing. They're often talking about how they came to a conclusion about an answer. And one thing I've had to think about is how I can promote collaboration and helpful discussion as opposed to argumentative discussion maybe.

And one thing I've started doing that I think really helps is I give each student their own answer sheet for the group portion of the exam. So functionally, each student is turning in two answer sheets, one for their individual performance and one for their group performance. I used to do just one group exam per group, and I didn't like that for two reasons. One reason is that if people truly disagreed within a group, then if they got that answer wrong, then that person is angry. One of the students comes away upset that they really were right and the rest of the group just didn't listen to them. And that goes away when everyone has their own group answer sheet because it's saying you're ultimately responsible for your own performance, but you get the benefit of talking about it with your group.

The other reason I didn't like doing one answer sheet per group is because it does not sync elegantly with the learning management system. I think there may be ways to assign one group score to a group, but then I just didn't want to deal with that. I was looking at spreadsheets. I was losing all this time trying to look at the student name and which group they're in. Learning management systems are meant to easily upload one student performance metric for one assignment. So I like keeping—each student gets their own group answer sheet that they submit individually.

Another thing I found about this group portion of the exam where everyone's talking is the type of questions that you ask matter. And there are certain types of questions that are better-suited to this assessment strategy than others.

So there are two questions that really don't do well, types of questions. One is open-ended questions that have multiple correct answers. I used to ask questions like, Design an experiment to answer such and such. And then students would get into a group, and I'd have three students who had three great ideas for different experiments that were not similar to each other at all. And they really struggled with how to come up with a unitary response or how to come to a consensus about how to answer that question. And from my perspective, I was like, Just write down your own one, write down what you put. It doesn't matter. But from the student perspective, they want to know what's the best answer. And so these really open-ended, you can take and run with it in multiple directions type questions, I found do not work super well.

The other types of questions that don't work very well are recall or memory-based questions because if an exam has a lot of those and the students are just sitting next to each other, I got D, A, C, B, they're just checking it off as they go down. They're not actually talking about the content of that question that you want them to engage with. So I now write my exams very heavily weighted towards very difficult passage and analysis-based multiple-choice questions because I find that hits the right balance between promoting discussion of the question, authentic discussion; it gives them a clear goal that they can talk about within their group; and then having it as multiple choice also really helps my grading because with this technique, I'm doing double the amount of grading. I'm grading two exams for every student.

[JIM LANG]
Yeah. That's great. This is actually reasonable. This is a way to think about there [are] reasonable limits you have in terms of in a large class. Maybe the best kinds of questions are like this, but at the same time, you're dealing with these big logistical issues here. So you're choosing these particular kinds of questions, which are still good, but maybe not the ideal ones. Likewise in terms of the group, all these things come into play. We recognize the limits of this context but still doing a great job with all these other benefits that it's offering for learning and community and all that kind of stuff. So this is really important thing to note that, it's not, like, an ideal thing, but no context is ideal, and especially a large class has all these challenges to it.

[RACHEL BRANCO]
To be honest, I would love to engage with the students about these really difficult open-ended type questions, like design an experiment. But I was not asking a lot of those questions to begin with because in a 200-person class, that's just hard to grade period, right?

[JIM LANG]
Right.

[RACHEL BRANCO]
And this might be more relevant to the science instructors out there, but the MCAT is also a very difficult passage-based, analysis-driven, multiple-choice test. And so it is completely possible to really ask students to engage authentically with the material using multiple-choice questions if they're well-designed. That means you have to be intentional about writing those questions and taking the time on the front end to design those questions, but they can be really fruitful when it comes to the two-stage exam that my students have reported as helpful for the MCAT preparation, as well.

[JIM LANG]
Oh, that's great. So how transparent are you with your students about why you're doing this process and what the research shows, et cetera?

[RACHEL BRANCO]

Yeah. I lay it all out on the line, Jim. I tell them everything. (both laugh) I put it in the syllabus in writing, and then on the first day of class, we take some time to talk it out. And I think that's really important both to discuss the rationale and to discuss the mechanics of how it's going to work. Because the rationale, letting the students know this will improve your retention of material, this will give you a way to connect with other people in the class, this will give you a way to practice articulating your thoughts as it relates to this content. You don't want the students to feel like they're out at sea, that there's a method to your madness. Particularly if they've never encountered this type of assessment before, then you're messing with something that's really important to them. It's their job to take their exams. They feel quite stressed about it. So they want to know you know what you're doing and that you are doing something that will ultimately serve them. So I explicitly put that in both the syllabus and discuss it on the first day of class.

I do also take time to talk about the logistics of, from the student's perspective, what are you going to experience on exam day? So I tell them, You are going to walk into the exam period, you are going to have an email in your inbox saying, you sit at this seat number, it will be labeled or you sit at this group number, it will be labeled. You can keep all your stuff by you. You're going to have 50 minutes for the individual portion of the exam. You're going to have 25 minutes for the group portion of the exam. Because I want them to be able to fully visualize what this new assessment experience is going to be like before they come into the first exam. So yes, I do talk about it explicitly.

[JIM LANG]
And the way you talk about this is important, too, because you're saying, I want you to have all your cognitive resources available to you when you walk into the room. You're not worrying about what's going to happen logistically. That's really important. I think it's also worthwhile—that's what we're trying to do here, help people think about what this could look like in their own classes and helping people envision that, take some of the barriers away from doing something like this.

Okay. Last question here. So how has your teaching evolved as a result of doing this? So first time you did this, even before that, how have you grown, learned, evolved as a teacher from doing this process?

[RACHEL BRANCO]
Well, I've grown because it allows me to better trust the students in that when I was doing traditional exams, I—as they say, the sage on the stage—I was giving these lectures about this content-heavy material. I would give these exams that I thought were just genius and ask beautiful questions, and then they would get half of them wrong, and then they'd come to my office hours and ask me why they were wrong. With the introduction of the two-stage exam, I am now outsourcing a lot of that feedback and explanatory power to other students, which is great. It literally reduces the number of students coming to my office complaining about their

exam—I should say, with a combative attitude about their exam. But to put that in a more positive light, it means in a 200-person class, I now have 200 little experts talking to each other about it and hashing it out together.

I think it empowers the students to be a tool for their own learning within a group. And I'm obviously there as a resource to guide that, but it doesn't always have to be me about that, that's guiding that process for every single student, which in a large class, that makes a big difference. I remember thinking when I was doing traditional exams in my large classes, Man, I wish every single student would come to my office hours to review this exam. That would be so helpful for them. I wish they would do it the week after the exam, and then they would really remember what they got wrong. Well, now I don't have to wish for that anymore. They have to do it. They're doing the group exam. So they are getting this wonderful benefit of that immediate feedback and that aha moment from each other, which I really love to see.

[JIM LANG]
That's awesome. This to me is the kind of thing I love. It's one technique, one change you've made that has all these effects on the students' community, active learning, trusting the students. Very inspiring. Thank you so much for sharing all these details with us and also the reasoning behind it and the ideas of transparency. Great stuff. Thanks so much for talking with us today.

[RACHEL BRANCO]
Yeah. It's a pleasure talking with you. Thank you.

[JIM LANG]
(cheerful upbeat music)
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