

Plan and Implement Two-stage Exams for your Course – Q&A

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Why should I implement two-stage exams for my course? What are the benefits for students?

The individual exam portion is written by students as usual. The following group stage, which is a review of the concepts of the individual stage, provides students with:

1. a learning opportunity by reviewing the same and similar questions and concepts they just solved during the individual exam
2. an opportunity to practice course material by discussion and explanation
3. immediate feedback on how students did on the individual exam

What are the benefits for two-stage exams for me as an instructor?

You will get fewer questions and discussions from students regarding the exam and solutions. Your marking will be easier, because exams are shorter and there are common elements in both individual and group stages.

What is the best time-split for individual and group stages?

Generally, a split of 2/3 of the time for the individual exam and 1/3 for the group stage works well. If time can be added, adding it to the individual exam is preferable.

For example, for a 1h15 min midterm exam a split of 50 min for the individual exam and 20 min for the group stage works well.

For a 3 h final exam, a time split of 2h10 min for the individual exam and 50 min for the group stage works well.

The group part includes 3-5 min for group formation and handout of group questions.

What is the best split for the individual and group exams when calculating the exam mark?

A split of 85% of the mark for the individual exam and 15% for the group stage works well, rewarding students for participating in the group stage. It typically results in an average improvement of the exam mark of 2-3%.

A major buy-in for students (with the goal to stimulate discussion) is that the group result only improves the final mark, but does not decrease it. In case of a weaker group result than the individual exam, the mark of the individual exam prevails.

Rarely, very weak students paired with very strong students for the group stage show improvements of 5+% compared to the individual exam. Therefore, a maximum improvement cap of 4% is recommended for all students.

In practice, calculate the mark for the exam in two ways

1. Individual exam only (out of 100)
2. Individual and group exam with a 85/15 weighting (out of 100)

Choose the better mark for the final midterm mark.

What is a good group size?

Groups of 4 students work well together, giving everybody a chance to speak and bringing enough know-how to the table. To balance the numbers, groups of 3 and 5 students work too, but only exceptionally at the discretion of the instructor to avoid fragmentation into too many groups. For make-up exams with two students, pairs work as well.

How do I prepare students for the two-stage exam format?

Explain the exam mode at the very beginning of the term and repeat frequently as the term goes on, whenever group exercises are conducted.

Start encouraging group formation from the beginning of the course. E.g., you can ask students to form groups of 4 students and have them to get to know each other during first class. Do 3 rounds of introductions, have students change group after each round, and each student leaves class knowing the names and a bit of information about 9 other students.

Practice group formation and work frequently with peer exercises, solving problems together and submitting answers using e.g., an in-class response system such as clickers. Make the speed of group formation an entertaining contest (e.g., record the time it takes for groups to get ready) and encourage groups of four at all times.

Encourage students to change groups frequently to experience different discussion styles and settle into a group they are comfortable with. Most students will use their peer group also as study group throughout the term. This avoids student comments about being grouped with “incompetent students”, since the onus is on them to choose their group.

In larger classes (> 30), students are typically free to choose their group. In smaller classes (20-30 students) after an introductory period and initial assessments assigned groups can be useful, making sure that groups get along well, have different levels of knowledge and discuss questions staying on topic.

I can write good individual exams, but which questions should I ask for the group part of the exam?

The basis for the group stage is a subset of complex questions from the individual exam (either slightly modified or the same). Simple, single concept questions are removed for the group stage since there is a good chance that the group will come up with the right answer without too much of a challenge.

Questions integrating several concepts are preferable since these give rise to discussions about one or several possible solution pathways. An identical question will make it easy for students to draw on their memory from the individual exam they just wrote and compare their problem-solving approaches (and correct them as needed). A slightly modified question will typically lead to a more in-depth discussion about the concepts, while maintaining ties to the individual exam. A new question will challenge students to review concepts in detail and work closely together.

You can test drive potential questions as part of peer instruction exercises in class. Questions that stimulate discussion among students are good candidates for exams.

A suitable format would be e.g., 1-2 identical questions, 1 modified question, and 1 new question; adjustments are necessary depending on the length of the group stage.

I have an in-class midterm exam and class time is only 1h15 min. Can I still run a two-stage exam?

Yes. You need to make sure that students are experienced in forming groups quickly (practice beforehand!). You need to guide them with a firm voice and minimise delays. For a 1h15 min midterm exam a split of 50 min for the individual exam and 20 min for the group stage work well.

How is a group exam conducted?

Students write the individual exam as usual. At the end of the individual stage and once all individual exams are collected, instructions for the group exams are given. All students stay seated and are instructed not to talk (be firm!). Re-explain the group exam format and at the end of your explanations give the signal to form groups. Make sure that all explanations are complete, since it will be very difficult to have everybody be quiet once the group formation starts.

Students form groups of four and one student fetches a single, stapled copy of the group exam. Students, who do not have a group or incomplete groups (< 4 students) come to the front for matching. Groups with more (or less) than four students are only assigned at the end of the group formation stage (be firm!). Once all groups are seated/standing (preferably pairs facing each other) give the signal to start the group stage. Students work on one question at a time. Do not allow for the group exam to be ripped apart.

The grouping process does not take longer than 3–4 min with students experienced in group formation.

Once time is up for the group exam stage, ask the first student who signed the cover sheet to hand in the group exam.

Do I need extra TAs for the individual or group exams?

No, even with a course of 100 students and a firm voice or access to a microphone you can easily conduct the exam on your own. If students have practiced group work and group formation throughout the term, the transition between individual and group stage will be very smooth since most students forming a group will be sitting close to each other (if they are allowed to choose their seat freely). With assigned seating group formation takes a minute or two longer. At the group exam the main task is to keep groups from talking to each other, which happens very rarely.

What about students writing the individual exam with the Access Centre?

Discuss your exam needs with the Access Centre well before the first midterm and final exams.

Your goal must be to have all students write the group exam together and that students writing the individual exam at the Access Centre can join their preferred groups for the group stage.

Ask students to schedule their individual exam at the Access Centre with a start time that allows them to reach the common exam room at the designated end time of the regular individual exam and participate in group formation. Make sure students add some time to walk between exam rooms.

Students writing at the Access Centre cannot schedule their exam start time before the regular exam starts. They will not be on time for the regular group exam. What can I do?

If you have several students writing at the Access Centre, you can run group exam at the Centre itself. Make sure to have a room and invigilator in place for the group stage. Inform students prior to the exam of the situation so that they can get together before the exam and discuss. If you only have a single student writing the individual exam at the Access Centre offer the student the average group mark for the calculation of the exam mark as a last resort. Count the individual exam only, if the result is better than the combined mark.

What about students who cannot participate in group work?

Offer the student the average group mark for the calculation of the exam mark, if (s)he cannot participate in group activities at all. Count the individual exam only, if the result is better than the combined mark.

What about students who miss the regular exam (e.g., because they were sick)? Can they still write a group exam? What if this is not possible?

If you have several students writing a make-up exam, you can run group exam in pairs or with more students. Do not use groups larger than four students and split accordingly. If you only have a single student writing the make-up exam offer the student the average group mark for the calculation of the exam mark as a last resort. Count the individual exam only, if the result is better than the combined mark.

I have assigned invigilators who I do not know. How do I explain the exam format?

Meet the invigilators a few minutes before the exam starts in the exam room. Hand them an information sheet (see attached documents) and explain the group stage, which you will facilitate. Make sure that they know that you take full responsibility for the group stage and have invigilators ensure that groups do not communicate between each other as their sole task.

How are individual and group exams returned? When and how do students sign in and out of the exam?

Students finishing early can return their individual exam right away (and sign, if necessary). They will have stay seated quietly and wait for the individual exam to finish (you can provide brain teasers to those interested). Once time for the individual exam is up, the remaining exams are collected in bulk and sorted individually for signing at the end of the group stage to minimise the transition time. Sorting them alphabetically during the group stage helps to find the individual exam in case a student wants to verify upon signing.

My final exam is centrally scheduled. Can I still run a two-stage exam?

Check with staff at the Exams Office of your institution that your exam format does not violate any final exam guidelines. Once you have their OK, you are all set to run a two-stage exam. Make sure you plan ahead of time to have all prerequisites in place (e.g., a suitable room; see below)

What room preferences should I ask for when scheduling a two-stage exam?

Make sure all students are seated in a single room for the exam. Ideally, the exam should not be spread over several rooms. If this happens, see

below. Also, only your exam must be held in the assigned room; otherwise students taking a different exam with a different format (usually individual exam only) will not be happy with the noise.

My exam is spread across several rooms; can I still run a two-stage exam?

Yes. Make sure that students are aware of the situation as early as possible and explain why holding the exam in a single exam room is not possible. Release the seating assignment as soon as possible to give students time to form new groups if they desire to do so.

Ask a TA or invigilator (with a loud enough, firm voice or ensure access to a microphone) and train her/him in advance of the exam. Make sure (s)he knows that noise levels will increase after the individual exam and ensure that (s)he knows how to maintain control over the group formation process at all times.

What if I have further questions? Can I talk to you?

You can contact me by email (gregor.kos@concordia.ca) or by phone at (514) 848-2424, extension 3374 and I will be happy to discuss your questions with you.

References and documents used to compile this Q&A

1. B Hollis, B Clarkston, Collaborative Testing: Evidence of Learning in a Controlled In-Class Study of Undergraduate Students, *Journal of College Science Teaching* 43 (2014) 83-91.
2. M Fengler, PM Ostafichuk, Successes With Two-stage Exams in Mechanical Engineering, *Proceedings of the 2015 Canadian Engineering Education Association Conference (CEEA15, paper 023)*, University of British Columbia
3. K Knierim, H Turner, RK Davis, Two-Stage Exams Improve Student Learning in an Introductory Geology Course: Logistics, Attendance, and Grades, *Journal of Geoscience Education*, 63 (2015) 157-164.
4. University of British Columbia, Carl Wieman Science Education Initiative, Two Stage Exams www.cwsei.ubc.ca/resources/files/Two-stage_Exams.pdf (2014) (accessed 6 Aug 2018)
5. JF Zipp, The Impact of Two-Stage Cooperative Tests, *Teaching Sociology* 35 (2007) 62-76.

Attached documents in editable format

1. Information sheet for TAs and invigilators
2. Text for the Access Centre for students writing the group exam with the rest of class

3. Text for the Access Centre for students writing the group exam at the Access Centre
4. Step-by-step instructions for exam day on how to conduct the exam with your students
5. Sample exam (Analytical Chemistry)

Instructional Videos from the University of British Columbia

1. Two-stage exams by UBC Media Relations, <https://www.youtube.com/watch?v=ZVFwQzIVFy0>
2. Two Stage Midterm Exam for Large Class by UBC Science, <https://www.youtube.com/watch?v=b07Oue306wE>