Two-Stage Exams

In a two-stage exam, students first complete and turn in the exam individually and then, working in small groups, answer the exam questions again. During the group part students receive immediate, targeted feedback on their solutions from their fellow students and see alternative approaches to the problems. This makes the exam itself a valuable learning experience[1] while also sending a consistent message to the students as to the value of collaborative learning. In the numerous implementations at UBC, students are always highly engaged in spirited discussion during the group part of the exam. This exam format was first introduced in the UBC Faculty of Science in 2009 and is now being used in at least 20 science courses.

We have found that students' response to the use of two-stage exams is overwhelmingly positive. In response to a survey, 87% of the students recommended continued use of two-stage midterm exams and only a few percent recommended against their use.[2] Some student quotes indicate what they found useful about the exams:

> *"I was able to instantly learn from my mistakes."*
>
> *"Interesting. All had different ways [of] approaching the question. Very helpful to understand everyone's response and why they thought their answer was correct."*

Implementation

Two-stage exams can be easy to implement and have worked well in many UBC science courses.

Stage 1: Individual, between 2/3 and 3/4 of the examination time; a standard formal examination that students complete working alone.

Stage 2: After students turn in their individual exams, small groups solve similar or identical problems during the remainder of the examination time.

Generally the switch between the individual and group stage can be done in less than 5 minutes, even in large classes, if there is at least one instructor or teaching assistant for 50 students. The CWSEI has produced a short video showing logistics of a two-stage exam in a large class.[3]

The group portion begins after all individual exams are collected. Students work in groups of three or four on (mostly) the same problems as in the individual portion. They must come to a consensus on the answers and hand in one copy with the names and student ID numbers of all group members. Since the students have already worked on each problem during stage 1, solving the same problems again in stage 2 usually takes much less time – including the time for discussions and agreeing on a solution.

Strategies that have worked well:

Good practices	comments
Explain to the students why you are conducting exams this way	Tell students on the first day of classes that examinations will be conducted in this format and, more importantly, why this is done in this way.
Make exam about 2/3 as long as you would for a normal exam	Timing: have the individual part take up about 2/3 of the total time (e.g. 50-55 min out of an 80 min slot). It is more challenging to do a two-stage exam in a 50 min slot, but it is doable.
Give the majority of the exam score for the individual part	Typically weight 85-90% for the individual portion, and 15% to 10%, respectively, for the group portion.
Assure students that their overall exam score will not go down due to the group part	Implementing a policy that a student's grade cannot be lower than the individual score addresses concerns about fairness. In practice, it affects only a few high-performing students, as groups perform equal or better than individual students in almost all cases.

Give clear instructions	Clear instructions need to be given during the individual-to-group transition. For example, students should remain seated while their individual exams are collected. Remind and check that all names and student numbers are listed on the group exam.
Have a well-defined plan for managing the switch between individual and group parts	The switch can be done in less than 5 min; best to have at least one instructor or TA per 50 students. A short video showing logistics in a large class is at: http://blogs.ubc.ca/wpvc/two-stage-exams/.
Group size of 3 or 4 students	If groups are too large, there will not be enough time for each student to have their say, and it may be harder for groups to come to consensus. On the other hand, groups of 2 students will not have as much diversity of strategies.
Give out only one exam per group	It is very important that each group gets only one exam; they must come to consensus on their answers. If each student has their own, they give up on discussion too easily and don't correct their errors.
Various approaches for group part can be used	Examples of approaches that have been successfully implemented: 1. Repeat entire exam 2. Repeat subset of questions (e.g. the most challenging ones; conceptual questions work well) 3. Turn open-ended questions into multiple choice or ranking tasks 4. Add a more challenging question that wasn't on the individual part
A variety of question types can be used	Two-stage exams work well with any question type except for longer essay type questions and lengthy calculations. Most other types of questions are short enough or structured such that everyone can contribute.
Discourage students from working alone during group part	TAs and instructors can help with forming groups. Encourage all group members to be involved in discussing every problem.

It doesn't take much effort to run a two-stage exam; creating the group portion of the exam is easy because it is very similar or identical to the individual exam. The additional grading time of the group exams is short because there are fewer of them and most solutions are correct. This exam format is very popular with students; they appreciate the value of the immediate feedback and the learning that results from it.

[1] B. Gilley & B. Clarkston, Collaborative Testing: Evidence of Learning in a Controlled In-Class Study of Undergraduate Students, J. College Science Teaching, 43(3), pp. 83-91 (2014), www.cwsei.ubc.ca/SEI_research/files/Gilley-Clarkston_2-Stage_Exam_Learning_JCST2014.pdf.
[2] C. Wieman, G. Rieger, & C. Heiner, Physics Exams that Promote Collaborative Learning, The Physics Teacher, 52, pp. 51-53 (2014), www.cwsei.ubc.ca/SEI_research/files/Physics/Wieman-Rieger-Heiner_Two-Stage-Exam_PT2014.pdf; G. Rieger & C. Heiner, Examinations That Support Collaborative Learning: The Students' Perspective, J. College Science Teaching, 43(4), pp. 41-47 (2014), www.cwsei.ubc.ca/SEI_research/files/Rieger-Heiner_2-stage-Exams_JCST2014.pdf.
[3] Video (7.5 min): A two stage, 50 minute midterm exam for 300 students; excerpts with commentary, http://blogs.ubc.ca/wpvc/two-stage-exams/