

Two-Stage Exams

The transition to remote teaching has prompted instructors to explore alternative methods of assessment. This document is a resource for instructors who are interested in learning more about two-stage exams and how to implement these exams in the remote environment. Two-stage exams are an effective assessment tool in both face-to-face and remote courses for supporting students' learning, offering opportunities for connection and collaboration, and increasing students' motivation and engagement. They can be effective in all disciplines that would use traditional exams and can be used in any class size.


What are Two-Stage Exams?

In two-stage exams (also referred to as pyramid exams, tiered exams, or collaborative testing), students first complete and submit the exam individually and then, in small groups (typically groups of 3-5), answer the same or slightly different exam questions. The group exam can consist of:

- 1) the same questions as the individual exam;
- 2) a selection of questions from the individual exam (e.g., the most challenging questions); or,
- 3) new questions that are more conceptual or open-ended than the individual exam.

Two-Stage Exams in Remote Courses

In face-to-face courses, the individual and group stages occur during a single class period. Students complete the individual exam for the first 2/3 of class time and the group exam for the last 1/3 of class. In a remote course, the individual and group exams can both be completed synchronously or asynchronously, or you can use a combination of approaches. Your choice of approach will depend on students' familiarity with these formats based on your use of synchronous and asynchronous activities throughout your course (e.g., lectures, assessments, collaborative work), and other needs of your students (e.g., time zone differences that make synchronous group work challenging).

Individual Exam	Synchronous Students complete the exam at the same time	Asynchronous Students are given a specified time frame start and complete the exam (e.g., within a 24-hour period)
		
Group Exam	<p style="text-align: center;">Synchronous</p> <p>Immediately following submission of the individual exam, students complete the exam at the same time using breakout rooms in a video conferencing platform (e.g., Zoom, Teams).</p> <p>Benefit: Students can access the instructor or TAs for support during the group exam.</p>	<p style="text-align: center;">Asynchronous</p> <p>Students are given a specified time frame to complete and submit their exam (e.g., within a 24-hour period). Students schedule a time to meet with their pre-assigned group (e.g., in Zoom, Teams) during that time frame. The group exam can occur immediately following the individual exam, or within the next 1-2 days.</p> <p>Benefit: Students schedule the group meeting at their convenience, and groups can work at their own pace without time pressure.</p>



Sample Two-Stage Exams in a Remote Environment

Jay Wickenden and Jaclyn Stewart, UBC, Chemistry

For more details, see their [recorded session on remote two-stage exams](#) and Jay's [Twitter thread](#)

Exam Details

- Both exams were “open resources” (students can use books, internet)
- Students with time accommodations start the individual exam earlier so that they finish at the same time as the rest of the class. All students write the group portion at the same time.
- Students do not have to write the group portion.

	Individual Exam Process	Group Exam Process
Format/ Questions	Around 60% multiple choice (distributed via LMS quiz) and 40% short answer (administered using Gradescope)	Same set of multiple-choice questions as the individual exam. Different short answer questions than the individual exam to prevent students from resubmitting their responses. Added a first question that asked students to enter their group members names and IDs.
Set-Up	Link to individual exam is available in the LMS at the start time. Students complete the individual exam synchronously, signed into Zoom. Students are put into rooms of 15-20 students with one TA.	Group exam link appears in LMS at the group exam start time. Students randomly sorted into groups of 4-5 in Zoom breakout rooms. Students were told that only one person submits on behalf of all (groups are encouraged to select a recorder, who shares their screen). If more than one student submits, the lower grade is kept.
Timing and Submission	Students wrote exam for 60 minutes, then were afforded 10 minutes to submit their work and their quiz. Once time expired, students were pulled back into the main Zoom room. Individual exam link disappeared in LMS once the time deadline was reached.	Students wrote group exam for 60 minutes and then were afforded 10 minutes to submit work.
Tips	<ul style="list-style-type: none">- Disable person-to-person chat- All students should be instructed to join and mute before the start of the exam- Instruct students to continue writing if they lose connectivity and to reconnect as soon as they can	<ul style="list-style-type: none">- Enable screen sharing in Zoom settings- Allow for late submissions- Before starting group portion, announce that students who do not wish to participate in the group exam should leave before you sort students into groups- Make sure that the LMS quiz is set up so that questions and answers are not randomized, so all members are seeing the same exam- Jay did not recommend pre-forming groups, as challenges arose with students providing the correct email



The Benefits of Two-Stage Exams: Evidence from Research

- **Students get immediate feedback:** Students receive feedback from their peers on their solutions while they still care about the questions. Students have a structured process to compare ideas, gather new information, and receive guidance and support.
- **Both high and low performing students benefit:** Two-stage exams benefit all students, but are particularly beneficial for lower-performing students if they are grouped with higher-performing students. Lower performing students benefit from explanations from their peers, and higher performing students benefit from explaining concepts and justifying their responses.^{1,2,3,4,5,6, 12}
- **Increased immediate learning and long-term retention:** In the group exam, students see different perspectives on how to think about course content and solve problems. Students engage in critical thinking, justification, and evaluation. As a result of this deeper processing, two-stage exams can lead to better retention of concepts and skills.^{4,7,8,9}
- **Develop collaborative learning skills and positive relationships among students:** Two-stage exams encourage all students participate, even those who are normally quiet. Having to reach a consensus and justify responses develops valuable group work and interpersonal skills.
- **Increased motivation to study, more positive perceptions of the course, and reduced test anxiety:** Students report less stress and a more positive attitude towards exams.^{3,5,10,11}

Implementation Tips

Explain why you are using two-stage exams	Tell students early and often about the exam, the process, and your expectations. Give clear instructions before and during the exam.
Set students up for success	Encourage collaborative work throughout the course, such as peer problem solving, think-pair-share, and small group discussions and activities. Reinforce the message that collaboration is important and give students opportunities to work with different peers. Offer practice exams for students to become familiar with the process and expectations.
Form groups of 3-4 students	Groups may be formed through planned pre-assignment based on specific characteristics (e.g., previous performance on exams or assignments), random pre-assignment, or student self-assignment. A group size of 3-4 students allows all students to have their say while still reaching a consensus, and offers a variety of different perspectives and strategies.
Weight students' grades more towards their individual exam score	Typically, the students' overall score is based on 85% of the score from their individual exam and 15% from the group exam. Students' individual performance matters most, but they are still incentivized to engage in the group exam. Instructors have also done a 90%/10% split or 75%/25% split.
Implement a policy where the group grade cannot lower a students' grade	If the group grade is lower than their individual grade, then the students' individual exam is weighted at 100% of their overall score. In practice, this affects only a few high-performing students, as groups perform equal or better than individual students in almost all cases.
Select appropriate questions	Avoid long essay-type questions, as these can be difficult to complete as a group within a time constraint.

For more implementation strategies, see:

- [Two-Stage Exams](#). Carl Wieman Science Education Initiative.
- [Plan and Implement Two-Stage Exams for your Course – Q&A](#). Gregor Kos, SALTISE.
- [Physics exams that promote collaborative learning](#). Weiman, Rieger, & Heiner (2014)
- [Tips for Successful Two-Stage Exams](#). The EOS-SEI Times



References

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- ¹²Engels, C.B., et al. (2017). [Two-stage exams: A powerful tool for reducing the achievement gap in undergraduate oceanography and geology classes](#). *Oceanography*, 30, 198-209.

