Timed Remote Assessments (TRAs)

What are TRAs?

Timed remote assessments are a type of open book exam that allows students to access relevant resources to answer examination questions. There is generally little or no control over the conditions under which the students complete the exam (no proctoring), but the assessment has an enforced time period that limits candidates' ability to 'research' answers.

Exam questions that are good for TRAs encourage and test high-order thinking skills (ability to apply, analyse, evaluate and create) and integration across topics rather than rote learning, memory and factual recall. They are often based on authentic real-world problems or scenarios and require students to personalise or contextualise their answers. They should also discriminate across a range of student performance, so beware of pitching questions 'too high'. Good questions can be harder to write and harder to complete, so consider very carefully what you need to 'test' and focus on the key module/programme intended learning outcomes; testing deeper integrated understanding of key concepts is often a better strategy than more 'superficial' testing of breadth of understanding.

Principles of good exam design

- Make academic integrity and expectations around it explicit. Implement an Honesty Code as a requirement of taking the exam and provide students with clear instructions on what is/is not permitted in terms of access to resources or other aid in completing the exam.
- Consider using plagiarism detection (Turnitin) for longer answer questions and small programmes with manageable student numbers – this may require care to interpret and take extra time/resource.
- Allocate reasonable time during which a student can complete assessment, yet limits looking up answers. Are speedy answering or efficient research learning outcomes? All students benefit from sufficient thinking time and those with disabilities may be entitled to additional time. Also be mindful of the possible influence of time-zone and IT difficulties.
- Give greater choice of exam questions. Consider using question banks, shuffle and/or randomize the questions so that it is more difficult for students to share answers.
- Provide information, data or background context that the students need to interpret or interrogate in order to answer questions – this way there is some standardisation and control of information readily available to students. Remember to make it explicit that all they need to answer is in the information provided.
- Present data and then ask students interpretative and application questions – consider using a complex data set for multiple related questions. This also can also provide an opportunity to use multiple versions of the data to discourage plagiarism.
- Ask some open-ended questions, after MCQ types, where students need to justify the reasons for their choice of answer. Very short answer questions can be better than 'single best answer' standard MCQs.
- Ensure that all materials shared with the students to be used in the exam are accurate. Consider sitting the exam yourself to check detail and process.
- Adjust your marking criteria so that they are appropriate for the new format and its expectations. Make this appropriately clear to both markers and students.
- Involve external examiners / professional bodies if appropriate in exam design – but be aware they may not fully appreciate the complexity of designing for TRAs

Principles of good question design

- Design individual questions and the overall exam paper with your key intended learning outcomes in mind - what skills, knowledge and understanding do you want/need to assess?
- Devise clear, structured, unambiguous questions to limit student confusion and time spent interpreting the question so students can spend their time effectively answering questions.
- Questions should not just be at a level of facts/definitions that are easily googled or shared.
- Questions should be formulated to allow students to demonstrate that they have read, digested, and understood the material and can apply this rather than simply requiring them to locate and re-write information.
- Customise questions by asking the student to relate the answer/topic/data to their own experience or a specific context or summarise and evaluate how they approached the question.
- Wherever possible questions should have a level of authenticity (typically in a practical or professional context) – context makes a question more engaging, difficult to google and encourages students to think more about their answer.
- Consider questions where students are required to present a justification for their argument, critique their supporting evidence and/or briefly explain their research/search strategy and evaluate sources of information used – sources should be appropriately cited and referenced.
- Google answers to your questions – if you can find them easily so can your students.

Question formats

Short or long answer questions lend themselves well to TRAs as they can explicitly ask students to apply knowledge or explain a reasoning. Make sure you indicate expectations such as answer length and marks available for each question or part question. Both these formats can be based on authentic scenarios &/or data and asking students to demonstrate that they have read, digested, understood, and can apply the material.

Consider 'Fermi questions' that cannot be answered simply, but require strategic thinking, assumption and reasoned estimation eg. How many doses of vaccine would be needed to protect the UK against …

More complex MCQs testing higher order skills can also work well in open book TRAs, consider:

- **Alternate choice** – standard single best choice MCQs; try to avoid easy to look-up facts and consider a 'bank' of questions, random question order and/or different question versions that test the same ILOs to discourage cheating.
- **Scenario based MCQs** – standard but based on interpreting an authentic professional context or example rather than on memorising (googling) facts.
- **Order rank questions** – asking students to rank the possible answers, this could be followed by a brief personalisation or justification of the answer.
- **Assertion reason** – questions that are more complex and require integrated understanding. Typically consist of an assertion followed by a reason. Answer choices are often a) Both assertion & reason are true, and the reason is a correct explanation of assertion b) Both assertion & reason are true, but the reason is not a correct explanation of assertion c) Assertion is true but reason is false d) Both assertion and reason are false.
- **Very short answer questions** – similar to MCQs but students give their own one- or two-word answer rather than choosing from alternatives.

Practical examples of how to approach designing good questions: Things to consider

Provide a diagram, graph, dataset, case study (report or clinical/research scenario), ideally with 'real-world' relevance and authenticity and ask related questions – ask students to ...

- label, annotate, or identify an under-pinning concept or principle
- explain, interpret, analyse, and evaluate information
- predict outcome and explain the reasoning for their answer
- make reasoned assumptions and estimations to calculate outcomes
- develop a contextualised or personalised answer
- justify, critically evaluate their sources, research strategy, or approach to the question

Applying	… apply knowledge and understanding to a particular task or problem. … try and ensure the task or problem is authentic and contextual.	How would you use … to …? What examples can you find to…? How would you solve ___ using what you've learned? Explain …. using only the data/information provided? Describe the geometric effect of the transformation __, given by … Find the eigenvalues and corresponding eigenvectors of [matrix] What other information is needed in order to ..,.? If …. changed in the scenario – what would you expect to happen? Briefly summarise the method you would use to …? Why do you think the person in the scenario did what they did … What would you do differently? Give two contrasting examples of how this data/information is used in practice to …
Analysing	… examine graphs, data &/or diagrams and interpret meaning or predict outcomes … can also analyse and explain practice	Why is X different to Y? Compare and contrast… What effect would that have? What is the relationship between A and B? Using the provided diagram what would happen if …? Based on the case study, what is the most likely cause of …? Give examples which do/<u>don't</u> satisfy the following constraints … Identify assumptions, confounds or missing factors Rank the objects in order of … Select which if these is likely to happen if … In the following model solution/proof …. Explain why …. Sketch the graph you would expect if … changed What is assumed here … What could we assume instead?
Evaluating	… make judgements about data, experiments, concepts or ideas, and practice. … can also reflect and self-evaluate	What is most important/ effective in …? Which method is best for…? Why does the proof of a theorem go wrong for this example? Which is the strongest argument? Is there reason to doubt that evidence? Critique or correct the following incorrect answer/proof … Decide which … is most effective / best adapted to … If … happened, what would happen as a result? - Why? Evaluate these claims / designs and justify your choice
Creating	… develop new ideas from what students know and understand and/or their research.	How would you design a …? What alternatives are there to …? What changes would you make? Suppose you could … what would you do? Can you formulate a theory to account for these findings …? Design an experiment / investigation to carry this work forward Prepare a lay abstract to persuade a panel to approve this grant …

Preparing students for open book TRAs

For some students, having access to resources creates a false impression that the exam is 'easier'. If they approach the exam with that misconception and do not do well this leads to negative emotions that may impact further learning.

Many good students have revision strategies based on memory and an ability to organise material; this works well where factual recall is rewarded. Students can be nervous and feel unprepared if the situation changes and they perceive factual recall will be less rewarded or less discriminatory.

Therefore, it is important to prepare students for taking TRAs; consider the following points:

- Explain what 'open book' TRA means in your context and how it is different to a traditional closed book exam. Clarify what will be examined, how it will be marked and what will be rewarded. Be explicit about what resources are and/or are not permitted for students to access during the exam and what is expected in terms of referencing.
- Discuss the perception that this exam is easier is incorrect as the questions are more complex and test higher level skills such as application, analysis, and evaluation.
- Emphasise the fact that researching answers might be time consuming therefore familiarity with resources and time management is important. Introduce strategies that help with this.
- Explain that a 'traditional' exam preparation strategy may be less effective and ask students to reflect on the learning strategies they need for an open book TRA. This should include how to effectively organise and use the resources that are available to them.
- If there are no similar past papers, consider using exemplar questions that reflect the type of questions in the exam and have similar marking schemes. These could form the basis of revision sessions with students and if time and resources allow have a bank of questions that students can use to test themselves and each other.
- If you can, use a 'practice exam' to test process and give experience of the type of questions. – Ask students to reflect on their experience and identify how they can better organise themselves and adjust their revision / study technique for the actual exams.
- Make the link between complexity and authenticity in the exam and what is required in a real-world context, explain why this may be useful to students in future.
- Discuss the links between examination, revision, and learning – consider assessment as 'for learning' not just 'of learning' and how 'cheating' can be detrimental in the longer term.
- Be explicit about academic integrity and expectations, ideally include the students so there is a degree of consensual co-designed agreement around process and expectations.

Further information

Workshop – Designing & supporting online assessment: https://www.imperial.ac.uk/staff/educational-development/workshops/a-practical-guide-to/designing-online-assessment/

Teaching toolkit - Remote Assessment: https://www.imperial.ac.uk/staff/educational-development/teaching-toolkit/remote-online-learning/assessing-and-giving-feedback-remotely/

Imperial Case Studies:
www.imperial.ac.uk/staff/educational-development/teaching-toolkit/remote-online-learning/case-studies/

- Converting to online exams in computing: converting-to-online-exams/
- Converting to TRAs: converting-face-to-face-exams-into-timed-remote-assessments-tras/
- Electronic marking and tests: electronic-marking-and-tests/
- Padlet for assessment: padlet-for-assessment/

TRAs in Chemical Engineering @ Imperial: https://pubs.acs.org/doi/10.1021/acs.jchemed.0c00617#