Designing effective objective test questions: an introductory workshop

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Workshop aims

In order to create good assessments with CAA, it is necessary to understand the potential and limitations of objective test questions. This workshop will consider:

- pedagogical issues associated with the use of objective test questions
- standard and advanced question types
- question design
- integration of objective testing with other assessment methods
- issues associated with scoring and analyzing objective tests

Participants will have the opportunity to discuss the merits and disadvantages of different question types, practise writing and improving questions, and consider ways of integrating objective testing with other assessment methods.

What are objective tests?

Objective tests require a user to choose or provide a response to a question whose correct answer is pre-determined. Such a question might require a student to

- select a solution from a set of choices (MCQ, true-false, matching)
- identify an object or position (graphical hotspot) or
- supply a brief numeric or text response (text input).

Because the correct answers to objective test questions are pre-determined, they are well-suited to CAA. The electronic marking of the responses is completely non-subjective because no judgement has to be made about the correctness or otherwise of an answer at the time of marking. However, it is worth remembering that in terms of in-built bias, an objective test is only as objective as the test's designer makes it.

Question types

The following are examples some of the question types appropriate for CAA:

- **Multiple choice questions** (MCQs) are the traditional 'choose one from a list' of possible answers.
- **True/False** questions require a student to assess whether a statement is true or not.
- **Assertion-reason questions** combine elements of MCQ and true-false.
- **Multiple response questions** (MRQs) are similar to MCQs, but involve the selection of more than one answer from a list.
- **Graphical hotspot questions** involve selecting an area(s) of the screen, by moving a marker to the required position. Advanced types of hotspot questions include labeling and building questions.
- **Text/Numerical questions** involve the input of text or numbers at the keyboard.
- **Matching questions** involve linking items in one list to items in a second list.
- **Sore finger questions** have been used in language teaching and computer programming, where one word, code or phrase is out of keeping with the rest of a passage. It could be presented as a 'hot spot' or text input type of question.
- **Ranking questions** require the student to relate items in a column to one another and can be used to test the knowledge of sequences, order of events, level of gradation.
- **Sequencing questions** require the student to position text or graphic objects in a given sequence. These are particularly good for testing methodology.
- **Field simulation questions** offer simulations of real problems or exercises.

Other question types require students to identify and/or manipulate images. Students may be asked to plot a graph, complete a matrix, draw a line or build up an image using parts provided.

Pedagogical issues

Objective tests are especially well-suited to certain types of tasks. Because questions can be designed to be answered quickly, they allow lecturers to examine a wide range of material. The use of CAA in the delivery of objective tests enables the provision of automatic feedback (in terms of scores, hints, praise, and guidance) to the student. Additionally, statistical analysis on the performance of individual students, cohorts and questions is possible.

The capacity of objective tests to assess a wide range of learning is often underestimated. Objective tests are very good at examining recall of facts, knowledge and application of terms, but a common worry is that objective tests cannot assess learning beyond basic comprehension. However, questions which are constructed imaginatively can challenge students and test higher learning levels. For example, students presented with case studies or a collection of data (such as a set of medical symptoms) can be asked to provide an analysis by answering a series of questions. If using a computer, students can be given electronic tools to manipulate or construct objects on a screen. Problem-solving skills can also be assessed with the right type of questions.

There are, however, limits to what objective tests can assess. They cannot, for example, test a student's abilities to communicate, to construct arguments or to offer original responses. Tests must be carefully constructed in order to avoid the decontextualisation of knowledge (Paxton 1998) and it is wise to use objective testing as only one of a variety of assessment methods within a module. Nevertheless, in times of growing student numbers and decreasing resources, objective testing can offer a viable addition to the range of assessment types available to a lecturer.

Ways of using objective tests

There are a number of ways in which objective tests can be used in a module. **Formative** objective assessments can motivate learning, encourage students to keep pace with the teaching and enable lecturers to monitor progress. Students can use objective tests for **self-testing** purposes to determine whether they understand particular concepts and terminology. **Summative** assessments (those which count towards the final mark of a module) can be used to test the range of the student's knowledge of course material. Additionally, the capacity of objective tests to examine the breadth of a topic or module can be used to motivate good attendance throughout the course. Finally, **diagnostic** objective tests can help identify a student's prior knowledge of a subject area and enable a lecturer to modify course content to suit the student's needs.

Consider the following questions about the student profile of your module:

- Will the students come from varying academic backgrounds?
- Will some need more practice in certain areas than others?
- Do you need to know what their knowledge base is before the module begins?
- Would it be useful to receive feedback as the term progresses on the extent to which students understand the material?

If the answer is yes to any of the above, then using objective tests for diagnostic, self-test and formative assessments would be useful.

What types of learning can be tested using objective tests?

Bloom's taxonomy of educational objectives (Bloom, 1956) is a useful starting point for categorizing types of questions.

Table 2.2 Bloom's taxonomy and question categories

Competence	**Skills demonstrated**
Knowledge	• Recall of information • Knowledge of facts, dates, events, places • *Question words*: list, define, label, describe, name
Comprehension	• Interpretation of information in one's own words • Grasping meaning • *Question words*: interpret, discuss, predict, summarize, classify
Application	• Application of methods, theories, concepts to new situations • *Question words*: apply, demonstrate, show, relate
Analysis	• Identification of patterns • Recognition of components and their relationships • *Question words*: analyze, arrange, order, explain, connect, infer, compare, categorize
Synthesis	• Generalize from given knowledge • Use old ideas to create new ones • Organize and relate knowledge from several areas • Draw conclusions, predict • *Question words*: integrate, modify, invent, design, compose, plan, formulate, arrange
Evaluation	• Make judgements • Assess value of ideas, theories • Compare and discriminate between ideas • Evaluate data • *Question words*: appraise, judge, evaluate, defend, rank, conclude, discriminate, recommend

It is commonly assumed that objective tests are only useful for examining the first three or four levels of learning. However, some educationalists, including Simas and McBeath (1992), suggest that all six levels can be tested using objective test questions. Participants in the workshop will consider ways in which objective testing can be used to examine higher learning levels.

Integrating with other assessments

It is useful to integrate objective assessments with other methods in order to cover an entire range of learning levels and competencies. Before writing questions, analyze which elements should be assessed within the module and with what method. Identify those components of the module that can be examined using objective tests.

Prior to organizing the assessment, briefly analyze the question material according to course content, difficulty, learning level, assessment type and question style. Such a breakdown of assessment components can help you identify potential areas of low coverage and unequal spread – either in terms of content or question type.

In the workshop, participants will have an opportunity to consider methods for effectively integrating objective testing into an assessment profile and for analyzing the components of a specific objective test according to content, learning level and question type.

References

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