The Design of Multiple Choice Questions for Assessment (ABR)

Authors: David Jennings
Email: david.jennings@ucd.ie
Date: 30th May 2012
Workbook

The aim of this workbook is to provide a series of resources in considering the design and implementation of multiple choice questions for assessment.

The workbook is not exhaustive, but attempts to focus on a number of core issues and needs.

Key areas covered include:
- Assessment Principles
- The Design of MCQs
- Developing MCQs in the Cognitive Domain

You are free to edit, adapt and copy this workbook and present it to your students and colleagues, however attribution must be given to the original author/s (this work is licenced under the Creative Commons Attribution Only Licence, see http://creativecommons.org/)


*Please note this is an abridged version of the workbook, for additional examples and further content contact the author

Further workbooks are available, for information contact David.Jennings@ucd.ie
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Introduction to Assessment</td>
<td>5</td>
</tr>
<tr>
<td>The Importance of Alignment</td>
<td>7</td>
</tr>
<tr>
<td>Matching Learning Outcomes to Assessment Types</td>
<td>9</td>
</tr>
<tr>
<td>Feedback</td>
<td>11</td>
</tr>
<tr>
<td>Validity vs Reliability</td>
<td>12</td>
</tr>
<tr>
<td>Designing Assessments</td>
<td>13</td>
</tr>
<tr>
<td>Ten Guiding Principals for Assessment in the Modular System</td>
<td>14</td>
</tr>
<tr>
<td>The Design of an MCQ</td>
<td>15</td>
</tr>
<tr>
<td>Deciding When to Use an MCQ</td>
<td>16</td>
</tr>
<tr>
<td>The Key to Designing MCQs</td>
<td>17</td>
</tr>
<tr>
<td>The Editing of MCQs</td>
<td>19</td>
</tr>
<tr>
<td>Question Options in Blackboard</td>
<td>21</td>
</tr>
<tr>
<td>Preparing Questions for BlackBoard</td>
<td>22</td>
</tr>
<tr>
<td>Example MCQs</td>
<td>23</td>
</tr>
<tr>
<td>Bloom’s Revised Taxonomy of Cognitive Processes</td>
<td>24</td>
</tr>
<tr>
<td>Example of MCQs in the Cognitive Domain</td>
<td>25</td>
</tr>
<tr>
<td>Select Bibliography (URLs Accessed 06.12)</td>
<td>29</td>
</tr>
<tr>
<td>Notes:</td>
<td>33</td>
</tr>
</tbody>
</table>
An Introduction to Assessment

Some of the key purposes of assessment are; to enable the communication of the achievement and subsequent status of students during their programme of learning; to provide a means of self-evaluation and information pertaining to such; to identify student placement within educational paths and/or programmes; to address the evaluation and effectiveness of instructional programmes; and to simply motivate the learner.

<table>
<thead>
<tr>
<th>Student Learning</th>
<th>Certification</th>
<th>Quality Assurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide feedback to improve student learning</td>
<td>To pass/fail a student</td>
<td>Provide feedback to lecturers</td>
</tr>
<tr>
<td>Motivate students</td>
<td>To grade/rank</td>
<td>Improve teaching</td>
</tr>
<tr>
<td>Diagnosis students strengths, weaknesses</td>
<td>To license to proceed/practice</td>
<td>Monitor standards over time</td>
</tr>
</tbody>
</table>

Figure 1: Three Purposes of Assessment

Type and Rationale

Formative Assessment - **Assessment for learning**

Is the assessment that provides feedback to learners in order to help them learn, and feedback to teachers to enable them to decide how a student’s learning should be taken forward.

Summative Assessment - **Assessment of learning**

Is the assessment which provides overall and finite evidence of the achievement of students and of what they know, understand and can do, by assigning a value (often quantative) to what the student achieves.

Trends in Assessment

Written exams are being replaced by more continuous assessment and coursework. There is a move towards more student involvement and choice in assessment. Course outlines have become more explicit about the expectations in assessment. Group assessment is more frequently used (in line with the shift in emphasis within the curriculum from competition between students towards collaborative learning between students.) An understanding of process is now seen as, at least, equally important to a knowledge of facts (in line with the general shift towards a process-based, rather than product-based curriculum.) Student focused ‘learning outcomes’ have begun to replace more teacher orientated ‘objectives’. The focus is more on what the student will learn rather than what the teacher plans to teach. (This is in line with more student led approaches in the curriculum generally).

<table>
<thead>
<tr>
<th>From</th>
<th>Towards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Exam</td>
<td>Coursework</td>
</tr>
<tr>
<td>Tutor led</td>
<td>Student Led</td>
</tr>
<tr>
<td>Implicit Criteria</td>
<td>Explicit criteria</td>
</tr>
<tr>
<td>Competition</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Product assessment</td>
<td>Process</td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcomes</td>
</tr>
<tr>
<td>Content</td>
<td>Competencies</td>
</tr>
<tr>
<td>Course Assessment</td>
<td>Modular Assessment</td>
</tr>
<tr>
<td>Advanced Levels</td>
<td>Assessed prior Learning</td>
</tr>
</tbody>
</table>

Figure 2: Trends in Assessment

The Importance of Alignment

If the aims are unclear then the system falters. Clear and realistic outcomes provide learners with a good guide of what’s required to be learnt (and how this may be achieved – through suitable learning opportunities). It provides the lecturer with a direct guide and/or framework of how one may deliver and teach the programme.

Effective assessment methods and tasks are related to the learning outcomes and the methods and opportunities employed in learning. If written criteria are too vague then it is difficult for both, the assessor to ensure a consistency of judgment, and for students to fulfill the demands of the assessment task. Without close links between feedback, criteria and the assessment tasks, lecturers cannot help students to achieve the learning outcomes of a course or a programme.

Task:
Look at the following TagCloud, evaluate what assessment method/s you may be able to implement in your own teaching, explain how you would use it, the intended effect, and analyse the situation to address any potential issues.
Matching Learning Outcomes To Assessment Types

Different assessments drive different types of learning; this table offers a selection of alternative modes of assessment enabling students to work to their strengths, thus providing an inclusive approach to the assessment regime.

<table>
<thead>
<tr>
<th>Types of Learning: Learning outcomes</th>
<th>What is required from students?</th>
<th>Examples of Assessment</th>
</tr>
</thead>
</table>
| Thinking critically and making judgments | Development of arguments, reflection, judgment, evaluation | Essay  
Report  
Book review  
MCQ/SAQ |
| Solving problems / developing plans | Identify problems, define problems, analyse data, review, design experiments, plan, apply information | Problem scenario  
Group Work  
Work-based problem  
Analyse a case  
Conference paper (or notes for a conference paper plus annotated bibliography) |
| Performing procedures and demonstrating techniques | Take readings, use equipment, follow laboratory procedures, follow protocols, carry out instructions | Demonstration  
Role Play  
Make a video (write script and produce/make a video)  
Produce a poster  
Lab report |
| Demonstrating knowledge and understanding (Can be assessed in conjunction with the above types of learning) | Recall, describe, report, identify, recognise, recount, relate, etc. | Written examination  
Oral examination  
MCQs  
Essays  
Reports  
Short answer questions  
Mini tests |
<table>
<thead>
<tr>
<th>Managing / developing yourself</th>
<th>Work co-operatively and, independently, be self-directed, manage time, manage tasks</th>
<th>Learning journal Portfolio Learning Contracts Self-evaluation Group projects Peer assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designing, creating, performing</td>
<td>Design, create, perform, produce, etc.</td>
<td>Design project Portfolio Presentation Performance</td>
</tr>
<tr>
<td>Assessing and managing information</td>
<td>Information search and retrieval, investigate, interpret, review information</td>
<td>Annotated bibliographies Use of bibliographic software Library research assignment Data based project</td>
</tr>
<tr>
<td>Communicating</td>
<td>Written, oral, visual and technical skills</td>
<td>Written presentation Oral presentation Discussions / Debates/ role plays Group work</td>
</tr>
</tbody>
</table>

(Task:)
Perform a spot check on the modes of assessment above;
- How many do you use?
- Are you over assessing?
- What else is used at a programme level (is there a broad range of modes, is it distributed reasonably)? Do you offer a range of assessment to account for student preference (learning style)? Finally review your assessment protocol [what do students avoid, from what do they learn (engage with) most, what concepts are still problematic?]

(Adapted from Nightingale et al., 1996)
Feedback plays an important role in teaching and learning - learners need prompt feedback to learn effectively (Gibbs, 2007). In a meta-analysis of studies into student achievement, feedback was reported to be the single most powerful influence (Hattie, 1987), a finding supported by Black & Wiliam’s (1998) review of formative feedback on learning.

**Content**
Feedback should provide students with information on how they have achieved relative to the established learning outcomes, giving them an opportunity to understand where they have done well and indicate what they could improve on.

Research has found that feedback that explains where and why students have made errors can significantly increase student learning (Lysakowski & Walberg, 1981, 1982; Walberg, 1999; Tennenbaum & Goldring, 1989). This requires feedback to be constructive, specific, developmental, regular, and relate to specific aspects of the course (Gibbs & Simpson, 2005).

**Timing**
Timely feedback is essential for development, and delay in providing feedback diminishes its value for learning (Banger-Drowns, Kulik, Kulik, & Morgan, 1991).

Resource restrictions, however, have led to a reduction in the quality, quantity, and timeliness of feedback (Gibbs & Simpson, 2005). As a result, by the time feedback is received students have moved from the topic and it is no longer relevant to them, and focus remains on the grade assigned instead (Gibbs, 2003). It’s common in many modules that feedback on assessment (usually set for two-thirds of the way through the course) isn’t provided until after the exam, an approach that does little to facilitate learning.

To combat this and ensure rapid feedback Gibbs (2003) suggests that on occasion, the quality of feedback should be secondary in importance to timing and frequency, so long as it is still relevant and gets the attention of the student. To be effective, feedback should occur before the end of term to enable students to absorb constructive comments and suggestions and give them an opportunity to implement them before the final assessment.
Validity Vs Reliability

Assessments should be both valid and reliable. Validity describes the extent to which assessment measures what it purports to measure, and reliability that it achieves this consistently (Gronlund and Linn, 1990). Validity is considered more important than reliability, as without validity a reliable test will only consistently measure a trait inaccurately, i.e. a weighing scales consistently measuring flour 2oz lighter than it's true weight.

Types of Validity:

<table>
<thead>
<tr>
<th>Content validity:</th>
<th>Assessment should measure and assess what is expected to be learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive validity:</td>
<td>Can the assessment accurately assess future performance</td>
</tr>
<tr>
<td>Concurrent validity:</td>
<td>The extent to which results of an assessment can be collaborated by other evidence</td>
</tr>
<tr>
<td>Construct validity:</td>
<td>The extent to which the assessment captures evidence of constructs being assessed (e.g. attitudes, values, intelligence)</td>
</tr>
</tbody>
</table>

Types of Reliability:

<table>
<thead>
<tr>
<th>Stability:</th>
<th>The assessment should produce consistent results when applied to the same student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel-form:</td>
<td>An assessment measuring the same thing should give similar results</td>
</tr>
<tr>
<td>Internal consistency:</td>
<td>The components or items within an assessment when halved and assessed separately should positively correlate</td>
</tr>
</tbody>
</table>

MCQ Reliability:

| MCQ’s are less susceptible to guessing then that of T/F questions |
| There is little room for ambiguity in their answers as may be found in SAQs |
| The objective scoring of MCQ's alleviates inconsistencies that may occur in the marking of essay style questions |
Designing Assessments

Seven questions that lecturers might ask when designing an assignment are:
1. What are the outcomes to be assessed?
2. What are the capabilities/skills (implicit or explicit) in the outcomes?
3. Is the method of assessment chosen consonant with the outcomes and skills?
4. Is the method relatively efficient in terms of student time and staff time?
5. What alternatives are there? What are their advantages and disadvantages?
6. Does the specific assessment task match the outcomes and skills?
7. Are the marking schemes or criteria appropriate?

<table>
<thead>
<tr>
<th>Common weaknesses to avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tasks do not match the stated outcomes;</td>
</tr>
<tr>
<td>The criteria do not match the tasks or outcomes;</td>
</tr>
<tr>
<td>The criteria are not known to students;</td>
</tr>
<tr>
<td>Students do not understand the criteria;</td>
</tr>
<tr>
<td>Overuse of one mode of assessment e.g. written examinations, essays, or closed problems;</td>
</tr>
<tr>
<td>Overload of students and staff;</td>
</tr>
<tr>
<td>Insufficient time for students to do the assignments;</td>
</tr>
<tr>
<td>Too many assignments with the same deadline;</td>
</tr>
<tr>
<td>Insufficient time for staff to mark the assignments or examinations;</td>
</tr>
<tr>
<td>Absence of well defined criteria so consistency is difficult to achieve;</td>
</tr>
<tr>
<td>Unduly specific criteria which create a straitjacket for students and make marking burdensome for lecturers;</td>
</tr>
<tr>
<td>Inadequate or superficial feedback provided to students;</td>
</tr>
<tr>
<td>Wide variations in marking between modules and assessors and within assessors (self-consistency);</td>
</tr>
<tr>
<td>Variations in assessment demands of different modules</td>
</tr>
</tbody>
</table>

---

## Ten Guiding Principals for Assessment in the Modular System

Modular programmes can promote open, active and flexible learning by allowing (within an appropriate framework of support) students to take increasing responsibility for their learning (Blackwell and Williamson 1999, McMahon & O’Riordan 2006).

<table>
<thead>
<tr>
<th>Principal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assessment should align with the learning outcomes and the teaching / learning methods used (Biggs, 2003a; Biggs, 2003b).</td>
</tr>
<tr>
<td>2</td>
<td>Use the principle of “backwash” (the tendency for students to let what they perceive to be what the assessment regime will reward) to prompt higher order learning and the development of autonomous learning skills. (Biggs 2003a)</td>
</tr>
<tr>
<td>3</td>
<td>Give students clear and easy to understand details of the assessment criteria used (McMahon &amp; O’Riordan 2006)</td>
</tr>
<tr>
<td>4</td>
<td>Be aware of assessment and learning outcomes of other modules (Blackwell and Williamson, 1999)</td>
</tr>
<tr>
<td>5</td>
<td>Allow students choices and preferences in their learning (Elton 1988)</td>
</tr>
<tr>
<td>6</td>
<td>Use a number of shorter assessments, with a mixture of formative (feedback) and summative assessments, particularly in the first semester to ease students into the higher education learning experience.</td>
</tr>
<tr>
<td>7</td>
<td>Avoid overemphasis on the unseen written examination (Brown, Bull, and Pendlebury, 1997)</td>
</tr>
<tr>
<td>8</td>
<td>Use a variety of assessment types to support the principles of inclusive learning <a href="http://www.ucdoer.ie/index.php/Ten_Guiding_Principles/Exercises">http://www.cete.org/…</a></td>
</tr>
<tr>
<td>9</td>
<td>Don’t over-assess (Blackwell and Williamson, 1999; Association of Law Teachers, 1996)</td>
</tr>
<tr>
<td>10</td>
<td>Don’t cluster student assessments too close together (Blackwell and Williamson, 1999)</td>
</tr>
</tbody>
</table>

---

The Design of an MCQ

Deconstructing an MCQ:
A multiple choice question (MCQ) is one in which the learner is invited to select one alternative (the correct one being the ‘key’) from a list of options (including the former and the ‘distractors’ – incorrect answers) in response to the question (‘stem’).

Thus a standard MCQ will consist of three core elements, the stem, the distractors and the key.

How many economists does it take to change a lightbulb?
1. They can’t tell you unless you give them a lightbulb approximation to work on.
2. They’re projecting three for next year, but that’s a conservative estimate.
3. Nine. One to change the bulb, and eight to hold a seminar on how Nietzsche would have done it.
4. One, but they’ll spend three hours checking it for alignment and leaks.
5. How many did it take this time last year?

*See footnote for identification of other miscreants! distractors.

Query:
Is an MCQ the most appropriate means to test the desired outcome?

Are there viable alternatives… Short Answer Questions, Assertion-Reason questions, Multiple Response Questions, Essay, Portfolio, Performance etc

What are the benefits of the MCQ?

* 1 = Physicists, 2 = Economists, 3 = Philosophers, 4 = Engineers, 5 = Statisticians
Deciding when to Use an MCQ

The use of MCQs is an attractive solution to the ever burgeoning assessment requirements, in that they may offer a fast and effective means to assess student learning… but what kind of learning…?

**Advantages of MCQs:**
- Easily marked, objective and reliable
- May measure different cognitive levels
- May offer diagnostic, formative or summative assessments
- May offer opportunity for feed forward (assessment for learning) and feedback
- The development of question banks may offer mid to long-term benefits to learners and faculty

**Issues with MCQs:**
- Developing good distractors is hard work
- Often difficult to determine why certain distractors are chosen i.e. no ability to garner feedback from student input/thought processes
- Often tend to test lower cognitive abilities (as these are easier to construct)
- They are difficult to write well and thus time consuming!

**Assessment Comparison / Equivalence**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Learner Effort</th>
<th>Faculty Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Questions - 1 hour exam</td>
<td>c.9 hours preparation</td>
<td>Writing the Q’s Grading Task Grading time Validity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCQs - 1 hour exam</td>
<td>c.9 hours preparation</td>
<td>Writing the Q’s Grading Task Grading time Validity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Key to Designing MCQs

Preparing MCQs:
- Write them as you prepare your session plans
- Relate them to the intended outcomes (one per question)
- Make use of common misconceptions and frequent questions
- Invert the approach and invite students to design MCQs
- Invite a colleague to evaluate the MCQs and eradicate any issues

Developing MCQs:
- Present practical or real world scenarios e.g. journal articles that require interpretation, case studies that require analysis
- Make use of visuals that require a learner to analyse, evaluate or describe the application of ‘x’
- Use data (charts, graphs, figures etc) that require the learner to appraise or formulate an answer

Writing MCQs:
- Be concise and clear (always maintain the prime body of text in the question stem, not in the key and distractors)
- Ensure appropriate use of grammar i.e. do not unintentionally provide the answer via the stem
- Construct questions independently, avoid question series whereby information in one may provide context or even the answer to another
• Make sure each of the distractors is ‘viable’, provide uniformity in the proposed answers, and ensure no overlapping
• Avoid negative question constructs where possible, and the use of terms such as ‘None of the above’

Tips for MCQs
• Where possible group together similarly formatted question types
• Provide a progression from simple (easy) to complex (hard)
• Remember to mix up the order of the answers
• Statistically provide a minimum of 5 answers, thereby pushing out the ‘guess’ factor! [assuming you are competent to provide four distractors for each question]
The Editing of MCQs

This series of questions is a guide to enable one to review and amend your MCQs, and as such should be addressed post creation and ideally with a peer to hand…

**Are** the item/s addressed within the specified learning outcomes for the module / programme?
Only materials covered and identified should be assessed…

**Are** they written at the appropriate level? ⁶
Questions should not appear trivial, however they must not also seek knowledge beyond the scope required.

**Are** they written to assess the appropriate cognitive level?
Consider the design of questions to assess particular abilities and/or in differing situations.

**Are** the key and stem correct?
*Indisputably?!*

**Does** the stem state the question?
The stem should ordinarily contain a complete statement of the question… leading to a knowledgeable learner anticipating the answer. If not, the question often requires revision and the presence of further distractors.

**Is** all the information in the stem necessary?
Edit and edit again, less is best, any additional information may be leading.

---

⁶ [see http://www.ucd.ie/registry/academicsecretariat/level_desc.pdf]
**Are all of the distractors plausible?**

Each distractor must appear possible to less knowledgeable learners. Post statistical analysis will determine less worthy distractors.

**Are all of the distractors incorrect?**

*Indisputably?!?

**Do any of the options overlap?**

If the options are numerically based, it may be possible that a number of options are ‘un-intentionally correct. It is less common in text based options, but none the less a probability – best avoided.

**Do any of the options provide clues?**

A common occurrence (unconsciously) is to provide a term in the key that appears in the stem, but not the other distractors. Alternatively a key is often written in a more precise form than its fellow distractors.

**Are diagrams/graphics used where appropriate and are they clear?**

The use of a diagram may be a more effective way of visualising the question / hypothesis. They need to be clear and pertinent to the question – no room for excess imagery!
Question Options in Blackboard

These Question Type items link directly to the “Blackboard Help for Instructors” page (located therein under ‘Tests, Surveys, and Pools’), and contain further detail and on occasion some video tutorials.

In reality it is the technical structure (i.e. the Blackboard configuration) of these questions that differs, and mostly they are variants upon the objective question construct – although only one is identified as an MCQ, others may still be employed as such.

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Choice Questions</td>
<td>Provide one correct answer</td>
</tr>
<tr>
<td>Multiple Answer Questions</td>
<td>Enables multiple responses to be correct</td>
</tr>
<tr>
<td>Fill in the Blank Questions</td>
<td>Provide exact matching text answer</td>
</tr>
<tr>
<td>Fill In Multiple Blanks Questions</td>
<td>Provide exact matching text answers</td>
</tr>
<tr>
<td>Calculated Formula Questions</td>
<td>Provide formulaic answers</td>
</tr>
<tr>
<td>Calculated Numeric Response Questions</td>
<td>Provide numeric answers</td>
</tr>
<tr>
<td>Jumbled Sentence Questions</td>
<td>Provide correct matching items to request in stem hints/options etc</td>
</tr>
<tr>
<td>Matching Questions</td>
<td>Provide linked sets of answers</td>
</tr>
<tr>
<td>Ordering Questions</td>
<td>Provide an answer in a hierarchical manner, utilising all options</td>
</tr>
<tr>
<td>Quiz Bowl Questions</td>
<td>One provides the question rather than an answer</td>
</tr>
<tr>
<td>Hot Spot Questions</td>
<td>Identify a key area within an image</td>
</tr>
<tr>
<td>True or False Questions</td>
<td>Does what it says on the tin!</td>
</tr>
<tr>
<td>Either/Or Questions</td>
<td>Similar to T/F, but a slightly different construct</td>
</tr>
</tbody>
</table>
Preparing Questions for BlackBoard

There are a number of ways to prepare test questions for Blackboard.

1. Simply type the questions one at a time into Blackboard.

   The Blackboard On Demand site provides a set of video tutorials on most of the question constructs Test, Pools, and Surveys.

2. You may import a test bank provided by a textbook publisher.

   Refer to the publisher’s guidelines for aid, as each may vary.

3. You may prepare your test offline by Uploading Test Questions from Microsoft Excel.

4. Use a quiz generator, this enables you to paste/compose certain types of question constructs into an editor (rather than Blackboard) which then generates a file you may upload to the Blackboard ‘Pool Manager’.

Notes on question compositions: [http://www.csi.edu/blackboard/bbquiz/doc.asp](http://www.csi.edu/blackboard/bbquiz/doc.asp)

The generator: [http://www.csi.edu/blackboard/bbquiz/](http://www.csi.edu/blackboard/bbquiz/)
Example MCQs

The following examples and comments are taken from Burton et al (1991), Bull and Danson (2002) and Carneson et al (1996).

Example 1: Carneson et al (1996)

Philosophy of Education (First year B.Ed. course)

If we understand learning a school subject on the model of learning a language we can explain

a) why teachers do not articulate clearly.
b) why it is not possible to explain the point of the subject to someone who does not understand the subject.
c) why truth is important.
d) why subjective experiences are important.
e) why school subjects are so important.
f) why school subjects are taught verbally.

Lecturer’s approach: The lecturer’s intention was that in arriving at the correct answer (b), the students must have compared each of the statements with their essential understanding of the part of the course dealing with a model of "learning a language"; and they need to be able to understand and relate:

• the concept of a "model of learning a language";
• the general concept of understanding being a process, which in the course was linked to a particular philosophical stance;
• the argument presented in option (b) "why it is not possible to explain the point of the subject to someone who does not understand the subject".

Query:

Can you identify any issues with this question? (Don’t read ahead just yet!)
The correct option (b) is much longer than the distractors. The use of the double negative (not...not") in option (b) is confusing. One should not repeat the word "why" in front of each response, but include it as part of the stem.

Bloom’s Revised Taxonomy of Cognitive Processes

<table>
<thead>
<tr>
<th>Competence</th>
<th>Indicative Skills Demostrable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creation / Synthesis:</strong> the ability to put facts together into a coherent whole, or, creatively achieve a new understanding by linking facts together</td>
<td><strong>Question words:</strong> integrate, modify, invent, design, modify, compose, construct, create, reorganise, formulate etc.</td>
</tr>
<tr>
<td><strong>Evaluation:</strong> the ability to make judgements using criteria and standards</td>
<td><strong>Question words:</strong> appraise, judge, evaluate, defend, rank, conclude, discriminate, assess, contrast, recommend etc</td>
</tr>
<tr>
<td><strong>Analysis:</strong> ability to determine internal relationships</td>
<td><strong>Question words:</strong> analyse, arrange, order, explain, connect, infer, compare, categorise etc</td>
</tr>
<tr>
<td><strong>Application:</strong> the ability to apply what is learned to a new situation</td>
<td><strong>Question words:</strong> apply, compute, demonstrate, show, relate, prepare, use etc</td>
</tr>
<tr>
<td><strong>Comprehension:</strong> the ability to interpret information in one’s own words</td>
<td><strong>Question words:</strong> interpret, discuss, predict, summarise, classify, extend, describe, etc</td>
</tr>
<tr>
<td><strong>Knowledge:</strong> the ability to recall facts, opinions and concepts</td>
<td><strong>Question words:</strong> list, define, label, describe, name, cite, match, reproduce etc</td>
</tr>
</tbody>
</table>

Based on Anderson et al (2001)
Example of MCQs in the Cognitive Domain

**Level 1 Knowledge** Carneson et al (1996)

Which one of the following persons is the author of “Das Kapital”?

1. Mannheim
2. Marx
3. Weber
4. Engels
5. Michels

Note that the responses are internally consistent - they are all the names of Germans whose written work have been major contributions on social issues.

**Level 2 Comprehension** Carneson et al (1996)

At this level, knowledge of facts, theories, procedures etc. is assumed, and one tests for understanding of this knowledge.

Which one of the following describes what takes place in the so-called *preparation* stage of the creative process, as applied to the solution of a particular problem?

1. The problem is identified and defined.
2. All available information about the problem is collected.
3. An attempt is made to see if the proposed solution to the problem is acceptable.
4. The person goes through some experience leading to a general idea of how the problem can be solved.
5. The person sets the problem aside, and gets involved with some other unrelated activity.

In this question, the knowledge of the five stages of the creative process must be recalled (*knowledge*), and one is tested for an understanding (*comprehension*) of the meaning of each term, in this case, "preparation". Note that this question violates the rule that the answer and distractors
should all be of about the same length. It is difficult to get around this one here, so the text is edited so that each line is about the same length.

**Level 3 Application** Carneson et al (1996)

In order to classify a question into this group, ask yourself if prior knowledge of the background to the question is assumed to be both known and understood, and whether one is merely expected to apply this knowledge and understanding. Calculations based on known formulae are good examples of this, as shown in the example below:

Which one of the following values approximates best to the volume of a sphere with radius 5m?

- a. 2000m³
- b 1000m³
- c. 500m³
- d 250m³
- e. 125m³

In order to answer this question, the formula \(4\pi r^3/3\) must be known (*recall of knowledge*) and the meaning of the various symbols in the formula understood (*comprehension*) in order to answer this question. The correct answer is #c.

**Level 4 Analysis** Carneson et al (1996)

Look at the following table and indicate which countries’ statistics are being reported in rows A, B and C.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Agriculture</td>
</tr>
<tr>
<td>A</td>
<td>500</td>
<td>2.5%</td>
<td>1.5%</td>
<td>51</td>
</tr>
<tr>
<td>B</td>
<td>1570</td>
<td>5.8%</td>
<td>1.6%</td>
<td>74</td>
</tr>
<tr>
<td>S.A.</td>
<td>2560</td>
<td>0.7%</td>
<td>2.5%</td>
<td>17</td>
</tr>
<tr>
<td>C</td>
<td>25110</td>
<td>1.7%</td>
<td>0.3%</td>
<td>6</td>
</tr>
</tbody>
</table>

Choose your answer from the following list of possible answers:

1. A is South Korea; B is Kenya; C is Canada.
2. A is Sri Lanka; B is Germany; C is Thailand.
3. A is Sri Lanka; B is Thailand; C is Sweden.
4. A is Namibia; B is Portugal; C is Botswana.

In order to answer this question, students must be able to recall the relative economic rankings of various countries (knowledge) and understand the basis for such a ranking (comprehension). They must be able to apply these concepts when information is supplied to them (application), and they must be able to analyze the given information in order to answer the question. The correct answer is 3.

**Level 5 Evaluation** Carneson et al (1996)
At this level, one is asked to pass judgement on, for example, the logical consistency of written material, the validity of experimental procedures or interpretation of data.

A student was asked the following question: "Briefly list and explain the various stages of the creative process".

*As an answer, this student wrote the following:*
*“The creative process is believed to take place in five stages, in the following order: ORIENTATION, when the problem must be identified and defined, PREPARATION, when all the possible information about the problem is collected, INCUBATION, when there is a period where no solution seems in sight and the person is often busy with other tasks, ILLUMINATION, when the person experiences a general idea of how to arrive at a solution to the problem, and finally VERIFICATION, when the person determines whether the solution is the right one for the problem.”*

How would you judge this student’s answer?
1. EXCELLENT (all stages correct in the right order with clear and correct explanations)
2. GOOD (all stages correct in the right order, but the explanations are not as clear as they should be).
3. MEDIocre (one or two stages are missing OR the stages are in the wrong order, OR the explanations are not clear OR the explanations are irrelevant)
4. UNACCEPTABLE (more than two stages are missing AND the order is incorrect AND the explanations are not clear AND/OR they are irrelevant)

In the above question, one is expected to make value judgment on the content of the given text (knowledge of the subject is required), the meaning of the terminology used (comprehension of the subject matter), and its structure (analysis of the answer for the right order of events. The correct answer here is #1, but suitable modification of the putative student answer could provide a small bank of questions with other correct answers.

**Level 5 Synthesis** Bull and Danson (2002)

Aim: to organise and arrange appropriate critical terms in order to construct a geological analysis of the following photographic image.

**Question:**
Move the appropriate descriptive terms from the list to the ‘form’ and ‘attitude’ boxes below.

The photograph is taken obliquely to the fold axis, therefore you cannot estimate the interlimb angle. However you can describe the form of the fold and the attitude of the fold axial plane. Move the appropriate descriptive terms from the list to the 'form' and 'attitude' boxes below.

- Gentle
- Isoclinal
- Asymmetrical
- Overfold
- Antiform
- Chevron
- Vertical

Click on 'Done' when finished.

Move pointer to term in list - click & hold left button - drag to position in label box on diagram.
Select Bibliography (URLs accessed 06.12)


Creanor, L. 2004, Activities for E-Learning, E-Learning Guides, Glasgow Caledonian University

Davies, P. (2001) 112 - Active Learning on Seminars: Humanities. SEDA


Gibbs, G 1995 “Structures for fostering discussion in larger groups" Oxford Centre for Staff Development.


http://www.hoover.org/publications/ednext/34687864.html


Notes:

End of Workbook