Asking Culturally Neutral Questions In Engineering

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Questions

'Some academics … write exams in which part of the challenge is to work out what the question means before answering it. Too often academics applaud this approach for being "clever", claiming that assessment is to sort out the sheep from the goats, and understanding the question's true meaning is part of that. "Nice one", their colleagues say, "the clever ones will work it out". But we do not include "cleverness" among the intended learning outcomes …'

Phil Race, The Higher, December 23rd 2005

Assessment

Within a module:

- Assessment must be equivalent for all students

- Assessment should address ILOs

- No bias w.r.t. gender, race, culture, background, disability

- Consistent from one cohort to another

A neutral question must:

- Relate to one or more ILOs which have been published to the students in advance

- Have a meaning which is clear to the student

- Be answerable with the resources available to the student

… but in Engineering

- Many students with English as a second language
- Much mathematical content so little practice with prose
- Wide cultural variation and vocabulary
- Expectations of professional bodies

And for some modules:

- Large classes from mixed disciplines

ILOs

By the end of an engineering degree we should be assessing *cognitive skills* at levels 5 and 6 of Bloom's taxonomy (knowledge, comprehension, application, analysis, **synthesis, evaluation**)

And….

- *Attitudes* – easily faked (Elton)
- *Practical skills* – now rarely tested

Bloom B. S., *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain.* New York: David McKay Co Inc, 1956

Level 1: knowledge – OK

Level 2: understanding – OK except for parroting

Levels 3 to 6: difficult – needs words like: analyze, categorize, compare, compose, contrast, create, criticize, critique, deconstruct, defend, demonstrate, design, devise, discriminate, distinguish, evaluate, generate, interpret, illustrate, justify, manipulate, modify, plan, predict, relate, reconstruct, relate and show

Vocabulary: Are the words you use equally familiar to all students?

Context: Are the examples you use familiar to all students (e.g. industrial process, engineered product, company structure, societal context)

Vocabulary

A study of secondary school pupils revealed large differences between claimed and actual understanding, e.g.

- Transmitted 96/30
- Qualitative 66/29
- Marked 82/12
- Significant 91/46
- Couple 97/24

Farrell, M. P. and Ventura, F., *Words and Understanding in Physics*, Language and Education, 12, No 4, 243-253, 1998

Words I used in the last 3 years

Assembly, auditor, balanced, batch, blizzard, chromium, client, construction industry, deadline, deliverable, finishing, functional, generalist, Human Resources Department, machining, morale, particulate, polishing, process, rapid prototyping, resource, revenue, review, sandwich, script, shooting (of film), stamping, standards, stock, trollies

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Context and vocabulary

Propositions for a SWOT analysis

"An advertising company should rent advertising space on students' foreheads."

"Let us build a fourth tunnel under the River Mersey for the use of pedestrians and cyclists."

Some observations about Chinese students

Analysis of the performance of 72 Chinese engineering and science students in a cohort of 374, over 2 years.

Exam with two types of question:

1. MCQ, demanding understanding of English but largely answerable by recall of lectured material or calculation from given data.

2. Free text response to 2 questions demanding suggestions relating to a hypothetical situation never seen before (by the students).

Student performance

	Chinese (overseas) students	All other students
MCQs (max 70 marks)	47.7 (68%)	45.5 (65%)
Open questions (max 30 marks)	14.6 (49%)	20.8 (69%)

What can we do about it?

Cooperative learning should help (active / teams / groups …)

Advice to examiners and exam moderators

Language classes for all

More essay / writing work

… but the cultural differences?

Thank you for listening – your comments are welcome