

## Design/analyze for an exam the specification table for the various levels in the cognitive domain

For the final exam of *Quantum Physics 1* of 21 Jan. 2010.

The levels in the cognitive domain (according to Bloom's taxonomy, Ref. [9,10] of the main UTS document) that are mentioned in the goals and intended learning outcomes of the course (section 2.1.1 of the main UTQ document) should come back in an exam.

Analyzing section 2.1.1 according to these levels in Bloom's taxonomy yields:

<i>Use concepts in a scientific discussion;</i>	<i>Level application &amp; analysis.</i>
<i>Use concepts when explaining them to fellow students;</i>	<i>Level comprehension.</i>
<i>Write a very short essay on the concepts;</i>	<i>Level knowledge up to application.</i>
<i>Use the concepts in solving problems;</i>	<i>Level application &amp; analysis.</i>
<i>Calculate the answers of a problem;</i>	<i>Level application &amp; analysis.</i>
<i>Estimate the answers of a problem;</i>	<i>Level analysis &amp; synthesis.</i>
<i>Evaluate the answers of a problem;</i>	<i>Level evaluate.</i>

Notably, these are for a large extent goals at the highest level, which brings the danger that when using this text when designing an exam yields mainly questions with all sub-questions immediately at the highest level.

The specification table (Ref. [9], page 32-33) below here shows nevertheless for the exam of 21 Jan. 2010 that there a range of levels in the questions that allows for assessing a student's level on a continuous scale from poor to excellent.

Topic	knowledge	compreh.	application	analysis	synthesis	evaluation
Question on Fourier Fourier, velocity from position		yes	yes (question goes from easy to hard)	yes	yes	
Question on angular momentum	yes	yes	yes (question goes from easy to hard)	yes	yes	
Question on particle in a well		yes also essay	yes also essay (question goes from easy to hard)	yes	yes	
General practice on exam						yes (students are told that a sensible evaluation of a wrong answer gives points, and they do this)