

# Aligning Assessment to Course Outcomes in OBE: Comparing the Application of Bloom's Taxonomy in Final Examination Papers in UiTM

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## ABSTRACT

*The philosophy of the Outcome Based Education states that education ought to produce particular educational outcomes, which give students some particular and minimum level of knowledge and ability. Assessment in this educational approach is, thus, crucial and must be aligned to the Course Outcomes of the course learned. The assessment blue-print in OBE has clearly stated the distribution of questions within the levels of Bloom's Taxonomy to ensure that students are assessed based on the right level of learning. This paper examines the distribution of the taxonomy in final examination papers in UiTM to find out whether or not the assessment blue-print has been adhered to. Using cluster sampling, 17 final examination papers were selected from 9 different faculties and analysed based on the Bloom's taxonomy framework. The data indicate that there is no standardization in the distribution of the taxonomy among papers, indicating that the blue-print has not been adhered to. The findings have very important implication on the process of preparing final examination papers so as to ensure the assessment and Course Outcomes are aligned.*

**Keywords:** *assessment, Bloom's Taxonomy, Course Outcomes, Outcome Based Education (OBE)*

## Introduction

The philosophy of the Outcome Based Education (OBE) has put forward that education must produce particular educational outcomes that give students some particular and minimum level of knowledge and ability. Such imperative requires Institutions of Higher Learning (IHL), above all, to provide a clear picture of what is most important for students to be able to do from their learning. Once this is obtained, the IHL needs to organize the curriculum, instruction and assessment to ensure that learning ultimately happens as recommended (Spady, 1994). Killen (2000) suggested that this can be achieved through appropriate organization of the education system and classroom practices. The OBE practice is seen apt in achieving this as 1) it provides continuous improvement in education by providing students with clarity of focus including all student assessment design that is based on clearly defined significant outcomes, and 2) it redesigns all the curricula with clear definition, focusing on significant learning that students are to achieve, high expectation and expanded opportunities (Killen, 2000). On top of this, OBE offers more cyclical model of life-long learning which includes essential skills, values and attitudes needed by learners to cope in a changing world (WCED, 2006).

One of the vital aspects in OBE is assessment. Wan Hamidon (2006) stated that assessment involves processes that identify, collect, use and prepare data for evaluations of achievement of programme outcomes or educational objectives. In the OBE approach, however, it is developed to contribute to the goal of improving student learning, specifically in knowledge and skills defined by the predetermined educational objectives and outcomes (Basri, 2006). Therefore, institution's assessment efforts should be on the measurement of student learning outcomes in a systematic and valid manner as assessment and evaluation processes provide critical information to the faculty and administrators on the effectiveness of the design, delivery and direction of an educational program (Basri, 2005).

Universiti Teknologi MARA (UiTM) practises two common assessment strategies which are formative and summative assessment. Formative assessment is done during academic weeks to assess students' mastery on learning outcomes, chapters and skills required. Summative assessment basically is carried out via final examinations to test the overall understanding of course outcomes (COs) in a course. Theoretically, final examinations questions should be set based on the assessment blue-print developed by the Curriculum Affairs Unit (Unit Hal Ehwal Kurikulum - UHEK). The assessment blue-print in OBE has clearly stated the distribution of questions within the levels of Bloom's Taxonomy to ensure that students are assessed based on the right level of learning. However, a quick preview of some of the papers reveals that the questions have not been distributed according to the prescribed weightage. Thus, this paper examines the distribution of the taxonomy in final examination papers in UiTM to find out whether or not the assessment blue-print has been adhered to in general.

### Designing Syllabus with Specific Course Outcome

The new curriculum with OBE compliance in UiTM has been developed since July 2010. All programmes in the university are obliged to deliver its courses according to the OBE principles. The implementation of the approach involves designing programmes with specific Programme Objectives (PeO), programme outcomes (PO) and course outcomes (CO). PeO and PO are assessed and evaluated at programme level. CO, however, is controlled within classroom practices.

CO is essentially determined to reflect the course content in general. It is a scheme which is to be achieved after students have completed the course. The statement of course outcome should be written in an objective sentence so that the documentation process latter on can easily be done. The CO can be designed more coherently and directly, encompassing the awareness of course nature and course content. Ambiguity and jargon sentences should be avoided to prevent confusion to lecturers and administrators (Asmidar & Norshariza, 2007). The following model describes the process of developing course delivery.

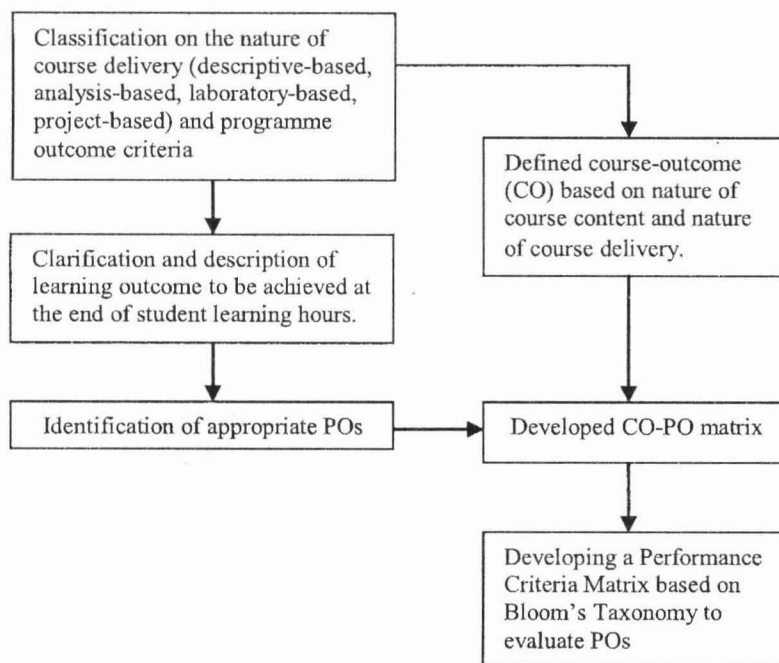


Figure 1: Developing Course Delivery Based on OBE (Asmidar & Norshariza, 2007)

### Bloom's Taxonomy and Blue-Print for Final Examination

The main aspect that has been assessed to reflect on students' level of understanding is their cognitive domain. Bloom's Taxonomy divides this domain into six different levels which are Level I - knowledge, Level II - comprehension, Level III - application, Level IV - analysis, Level V - synthesis and Level VI - evaluation. This differentiation is to show learners' achievement and progress at different levels across the learning spectrum. Table 1 describes this in more detail.

Table 1: Description of Bloom's Taxonomy Level

Bloom's Level	Term	Description
Level 1	Knowledge	Remembers previously learned material
Level 2	Comprehension	Grasp the meaning of material (lowest level of understanding)
Level 3	Application	Uses learning in new and concrete situations (higher level of understanding)
Level 4	Analysis	Understand both the content and structure of material
Level 5	Synthesis	Formulates new structures from existing knowledge and skills
Level 6	Evaluation	Judges the value of material for as given purpose

The blue-print for final examination is a framework designed to provide information and guidelines to set final examination questions. According to Roziyah, Zainab and Salliza (2010), this blue-print provides 1) mark distribution according to Bloom's Taxonomy level, 2) number of questions, and 3) duration of the examinations. Blue-print can also be extended to include selecting the number of sections, content, the learning outcomes to be addressed, the assessment standards to be addressed, the number of questions per section, the cognitive levels to be addressed within each question, the degrees of difficulty in each section, and the number of marks allocated per section and per outcome according to the weighting of the outcomes. Figures 2 - 4 are the blueprints prescribed by the UHEK for the setting of the final examination papers for the diploma level (OBE compliance) in UiTM.

YEAR 1	DISTRIBUTION									
	ASSESSMENT	Knl	Cmp	App	Anl	Syn	Eva	%	NoQ	DURATION
FINAL (%)	0.2	0.4	0.4	0	0	0	1	15	3 HOURS	
NO OF Q	3	6	6	0	0	0	15			

Figure 2 Assessment Blueprint for Diploma Programme (Year 1) (Roziyah et al., 2010)

YEAR 2	DISTRIBUTION									
	ASSESSMENT	Knl	Cmp	App	Anl	Syn	Eva	%	NoQ	DURATION
FINAL (%)	0.15	0.4	0.4	0.05	0	0	1	15	3 HOURS	
NO OF Q	2	6	6	1			15			

Figure 3 Assessment Blueprint for Diploma Programme (Year 2) (Roziyah et al., 2010)

YEAR 3	DISTRIBUTION									
	ASSESSMENT	Knl	Cmp	App	Syn	Eva	%	NoQ	DURATION	
FINAL (%)	0.1	0.4	0.4	0.05	0.03	0.02	1	15	3 HOURS	
NO OF Q	1	6	6	1	1		15			

Figure 4 Assessment Blueprint for Diploma Programme (Year 3) (Roziyah et al., 2010)

As can be seen from the figures, in Year 1 (Semester 1 and 2), questions should be set with 20% for level I, 40% for level II and 40% for level III. For year 2, (Semester 3 and 4), the distribution of mark allocated is 15% for level I, 40% for level II, 40% for level III and 5% for level IV. The students are expected to have mastered the lower cognitive skills after they have completed Year 1 and Year 2. Therefore, in Year 3, the projection is shifted toward higher level. The distribution, thus, should be 10% for level I, 40% for level II, 40% level III, 5% level IV, 3% level V and 2% level VI. This can be summarized in Table 2 below.

Table 2: Examination Blueprint for Diploma Level in UiTM

Year	Bloom's Taxonomy Distribution					
	Level I	Level II	Level III	Level IV	Level V	Level VI
Year 1	20%	40%	40%	-	-	-
Year 2	15%	40%	40%	5%	-	-
Year 3	10%	40%	40%	5%	3%	2%

## Methodology

The aim of this small scale study is to examine the distribution of the cognitive taxonomy in the final examination papers in UiTM. Specifically, its main objectives are 1) to analyse the levels of questions asked in the final examination papers based on the Bloom's Taxonomy, 2) to find out whether the assessment blue-print prescribed by the UHEK for the diploma programme has been adhered to or not, and 3) recommend measures to ensure the assessment objectives are met.

The secondary data used in this study were drawn from a sample of final examination papers of Semester 1, Semester 2 and Semester 3 diploma courses of January - April 2011 session. Altogether, 93 courses from various faculties at UiTM Pahang were identified to have already implemented OBE; 25 courses in Semester 1 (Year 1), 31 courses in Semester 2 (Year 1) and 37 courses in Semester 3 (Year 2). Cluster sampling was used to select the sample for this study as there are several similar subjects that are being offered to and taken by students from various faculties.

Out of the 93 identified courses, 25 courses of Semester 1 final examination papers were selected as the sample in this study. However, only 17 final examination papers of these courses were able to be downloaded from the Electronic Question Paper System (EQPS). The rest were not available in the EQPS as the papers had not yet been uploaded in the system on the date the secondary data were collected.

The analysis of the data involved examining, analysing and identifying the level of each question based on the Bloom's Taxonomy. The verbs used in the questions were used to determine the level of the taxonomy. The following table shows some of the verbs and their level.

Table 3: Bloom's Taxonomy Verbs

Level	Verbs
<b>Knowledge</b>	Count, Define, Draw, Enumerate, Find, Identify, Label, List, Match, Name, Quote, Read, Reproduce, Select, State, Write
<b>Comprehend</b>	Classify, Cite, Conclude, Convert, Describe, Discuss, Explain, Generalise, Paraphrase, Restate, Review, Summarise, Interpret
<b>Apply</b>	Assess, Construct, Determine, Demonstrate, Develop, Discover, Establish, Predict, Prepare, Produce, Provide, Show, Solve, Transfer
<b>Analyze</b>	Characterise, Classify, Compare, Contrast, Correlate, Debate, Deduce, Differentiate, Discriminate, Distinguish
<b>Synthesize</b>	Adapt, Anticipate, Compose, Construct, Create, Design, Generate, Formulate, Organise, Modify, Negotiate, Integrate
<b>Evaluate</b>	Appraise, Argue, Assess, Choose, Criticise, Decide, Defend, Justify, Judge, Prioritise, Rank

The data were then treated to simple frequency counts and converted into percentage according to the level of difficulties as analysed.

## Findings and Discussion

The analysis of the 17 final examination papers reveals that there is no standardization in the distribution of the taxonomy among papers, indicating that the prescribed weightage of the blue-print has not been adhered to. As mentioned previously, the blue-print for Year 1 has set the distribution of the taxonomy as 20% for Level I, 40% for Level II and 40% for Level III. However, unfortunately, Table 4 clearly shows that none of the papers examined has set the paper accordingly or even close to it.

Table 4: Distribution of Bloom's Taxonomy Level in Final Examination Papers in UiTM

No	Course Code	Bloom's Level (%)					
		Level I	Level II	Level III	Level IV	Level V	Level VI
1	OMT131/SSC131	44	56				
2	AGR122/109/132	63.64	26.36	0.91	9.09		
3	CHM105	21.8	26.7	6.93	44.6		
4	QMT105	0.89	28.57	48.21	14.28	8.04	
5	MAT117		9.92	83.47			
6	CHM160	41.67	18.33	18.33	18.33	3.33	
7	ACC106/100/105/107/111/114/115/150	15	7	41	18	19	
8	CTU101	18.8	81.2				
9	AIS130/CAC 130	45	40		15		
10	IDA102	10.6	85		3.5		
11	MAT112	6	25	69			
12	CHM420	13	39	43	5		
13	BIO103/BOT 104	62	30		8		
14	CSC133/134/434	43	57	10			
15	MGT162	17	73				
16	SPS113	86.3	10.8		2.94		
17	CSC118/408	32			68		

As can be seen from the table, only 6 papers contain questions up to Level III as specified for Year 1 (OMT131/SSC131 – Levels I & II; MAT117 – Levels II & III; CTU101 – Levels I & II; MAT 112 – Levels I, II & III; CSC133/134/434 – Levels I, II & III; and MGT162 – Levels I & II). However, only 2 of them contain questions in all the three levels (MAT112 and CSC133/133/134/434), while the rest of them only contain questions in 2 levels. As can be clearly seen in the table, none of them fulfills the 20%-40%-40% requirement as set in the blueprint.

The analysis also indicates a very uneven pattern of distribution in the level of taxonomy among the questions. For example, in MAT117, there is no question asked at Level I. Instead, Year 1 students are tested straight off at Level II. The bulk of the questions is designed at Level III (83.47%). On the other hand, different levels of taxonomy are tested in CTU101. The paper contained questions at Level I (18.8%) and Level II (81.25%). A very obvious contrast was found in CSC118/408 paper. The analysis shows that 32% of the questions are asked at Level 1, and another 68% at Level IV.

The analysis has also revealed some disturbing information regarding the distribution of the taxonomy in the final examination papers. Table 4 indicates that 11 papers have tested our diploma level students at the wrong level of assessment. These 11 papers contain questions that belong to a higher level of assessment that is not supposed to be tested in Year 1. For example, 8 of these papers, namely, AGR 122/109/132, CHM 105, QMT 105, CHM160, ACC 106/100/105/107/111/114/115/150, IDA 102, CHM 420, BIO 103/BOT 104, SPS 113, AIS 130/CAC 130 and CSC 118/408 contain questions that tested students at Level IV. Among these, CHM105 contains a considerable amount of percentage, i.e.

44.6%. In addition, three of these papers, namely, QMT105, CHM160 and ACC106/100/105/107/111/114/115/150 even contain questions at Level V of the taxonomy.

## Implications

The findings have very important implication on the process of preparing the final examination. It can be implied from the analysis that the assessment blue-print might have not been used as a reference during the process of setting/designing the examination questions. The uneven distribution of levels of taxonomy among the papers shows that there seems to be no standardization in the levels of difficulties assessed. This calls for a control of standardization so as to ensure that the measurement of student learning outcomes is carried out in a systematic and valid manner.

In addition to proper training, practice and supervision, the writers propose test setters to consider the following process in setting the final examination papers so that some kind of quality control can be guaranteed as shown in Figure 5.

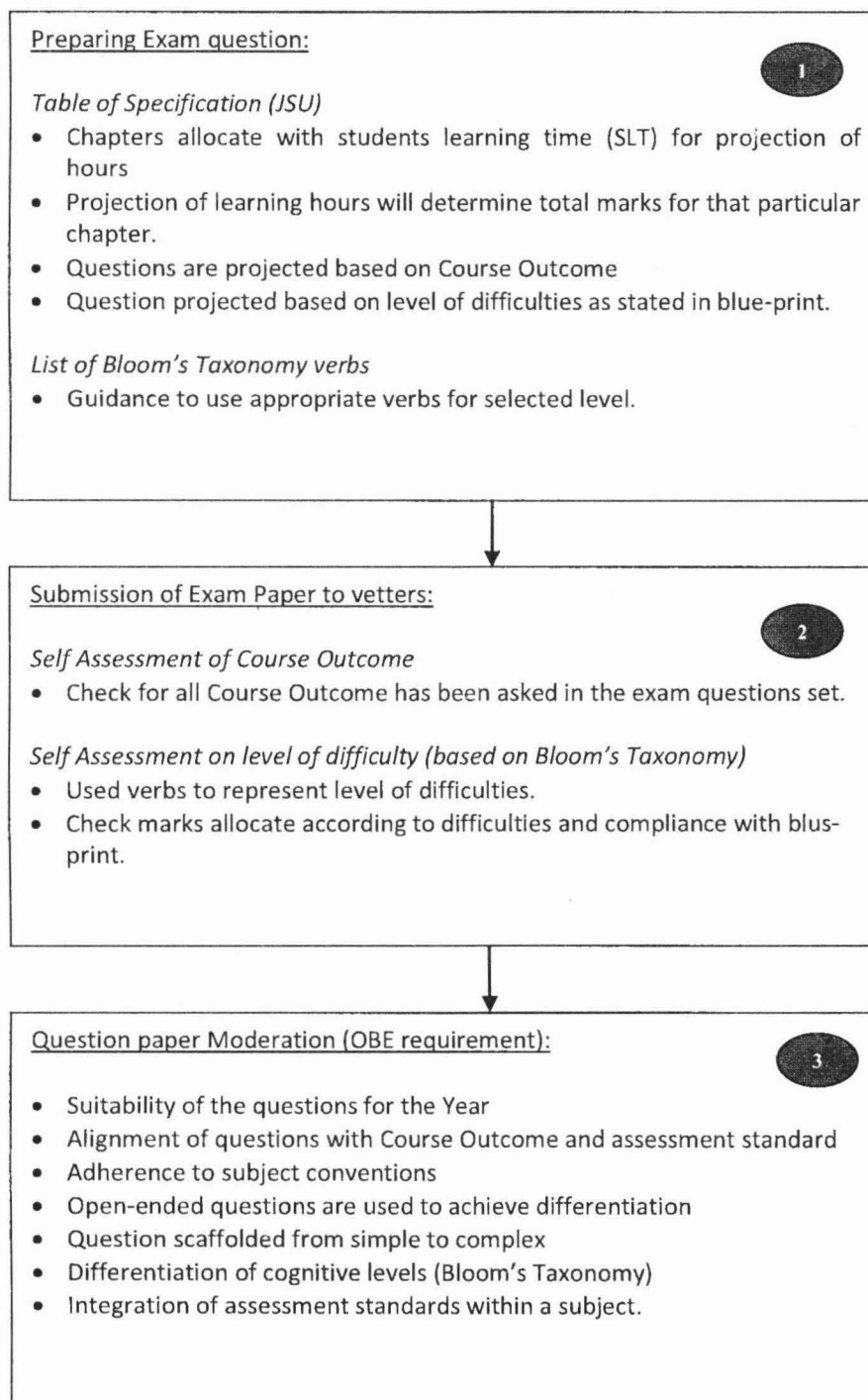


Figure 5: Quality Control in Setting Examination Papers: A Suggestion

## Conclusion

This small scale study has proven that designing examination papers cannot be simply done. The measurement of student learning outcomes must be carried out in a systematic and valid manner. The findings of this study call for all test setters to think of the serious repercussion of their questions on students' learning, effectiveness of a programme delivery and the direction of an educational programme. The setting up of a blueprint for the examination papers is not without a reason. Thus, test setters need to be aware of the significance of its existence in aligning assessments with learning outcomes.

## References

- Asmidar Alias & Norshariza Mohamad Bhkari (2007). A model of Outcome-Based Education (OBE) for engineering education. *Jurnal Gading*, 11( 2), 71-88.
- Basri, H. (2004). *Malaysia and the Washington Accord: The way forward for engineering education*. Paper presented at Conference on Engineering Education Kuala Lumpur.
- Basri, H. (2005, February 15-17). *The way forward for engineering education in Malaysia-continual quality improvement through the outcome-based approach*. Paper presented at the Workshop on Outcome-Based Education 1, Pan Pacific KLIA, Sepang, Selangor.
- Killen, R. (2000). *Outcomes-based education: Principles and possibilities*. Unpublished manuscript, University of Newcastle, Faculty of Education.
- Roziyah, M.J., Zainab, M.N. and Salliza, S. (Eds.). (2010). *OBE-SCL Training Modules for Lecturers: UiTM-Wide OBE-SCL Implementation*. Academic Quality Assurance Unit, The Academic Affairs Division, Universiti Teknologi MARA Malaysia.
- Wan Hamidon, W.B. (2006). Outcome-Based Approach to Education/Accreditation. Retrieved May 12, 2011 from <http://www.cheme.utm.my/cheme/images/Undergraduate/eac%20training%20modules.pdf>
- WCED. (2006). *Setting Examination Papers*. Retrieved May 12, 2011 from [http://curriculum.wcape.school.za/resource\\_files/32173036\\_eng\\_Detting\\_exams.pdf](http://curriculum.wcape.school.za/resource_files/32173036_eng_Detting_exams.pdf)
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