APPLICATION-BASED TEST BLUEPRINT FOR A SUMMATIVE CLASSROOM ASSESSMENT

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ABSTRACT
A test blueprint is an effective test construction tool that ensures a more objective means of judging the students' learning experience or performance. There are two (2) types of test blueprint namely: a test blueprint designed for formative classroom assessment and a test blueprint designed for summative classroom assessment. This paper focuses on the summative form of classroom assessment where evidence of learning is mainly to judge the performance of the students. Using a user-centered approach of development called Interaction Design Model, a simplified test blueprint has been designed using a Spreadsheet of four (4) different interlinked worksheets, namely: the test blueprint, the mapping matrix, the final exam moderation form, and the data store. The test blueprint comprises of the chapter number and chapter title, the percentage of chapter weight, the weighted mark, the actual allotted mark, and the level of difficulty (LOT/HOT ratio). The data store keeps all the pre-defined data that are necessary to complete the test blueprint such as the pre-defined LOT-HOT ratio of each course according to the nature and the level of the course. Automated values are available that shuns the user from keying the required data manually. The mapping matrix, which is prepared only after the test blueprint has been aproved, contains the following: the test formats, the number of sections of the exam, the chapter number from where each question item is taken, the Bloom's cognitive level and the total mark of each item. The spreadsheet provides hints, warnings, and comments that may guide the user throughout the preparation of a test blueprint, as a –precursor to writing test items.

KEYWORDS: *classroom assessment, test blueprint, summative classroom assessment, quality assessment*

JEL CLASSIFICATION: *A00.*

1. INTRODUCTION

Quality improvement is the ultimate goal of assessment that mutually interlinks it with quality improvement. In his book, Heywood (2000) describes assessment as the principle guarantor of quality assurance in education that provides a dominant influence on student learning with the belief that effective assessment depends on assessors, having a substantial knowledge of human development and learning.
Truly, the quality of assessment is mainly deep-rooted from the quality of classroom assessment procedures enforced by the institution. Assessment is an integral and vital part of the teaching-learning process which when properly done would create a boundless and vast ranging benefits to the students, teachers, and school leaders. Hence, teachers are expected to have an established proficiency on classroom assessment in order to positively influence the learning of the students. However, some teachers and institutions do not put into practice the fundamental purpose of preparing classroom assessments.

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Stiggins (2008) urges teachers to ask themselves the question: "Are we, the teachers, contribute to excellence in classroom management?" This is a call among teachers to be extra-mindful about the academic well-being of the students. The author of this paper believes that teachers are not only coaches and facilitators during instruction but also assessors and auditors during classroom assessment. This is in consonance to the etymological meaning of the term 'assessment' which originates from the Latin terms *ad* and *sedere* which means 'to sit down beside or together'. In this sense, teachers ensure the value of learning among students through the results of classroom assessment.

Effective classroom assessment should be given emphasis in higher education in order to prepare them as productive and successful citizens (Huba & Freed, 2000). Moreover, such an observation requires educational institutions to also reexamine its assessment paradigm. The most effective way of changing how and what students learn is to change the way teachers assess them.

In this paper, the author is highlighting the development of a test blueprint that can be used in a classroom assessment which is in contrast with large-scale assessments (such as external assessments). In a classroom assessment, the teacher who teaches the course is the same teacher who prepares the exam. The results are used to judge the learning experience of the students and to decide improvements in the learning needs and teaching-learning processes of the class.

The format of the test blueprint presented in this paper has been used by the Department of Information Technology of the Higher College of Technology (HCT), Muscat, Oman. Up to date, the department has one-hundred twenty-nine (129) academic staff, catering to nearly 1,668 students studying any of the following five (5) specializations: Database, Information Systems, Internet and E-Security, Networking, and Software Engineering. The department has its own exam preparation procedures. It makes use of a test blueprint as a tool to prepare test questions for a summative exam such as Final Examination where 'grading' or 'assessment of learning' is a key concern. A test blueprint is a tool used to support teachers in judging students' performance or assessing learning experience more objectively. However, prior to the Academic Year 2011-2012, teachers then were preparing their test questions very subjectively. Teachers were identifying question items that are based on their sole predisposition. Such a practice has yielded to the diverse coverage of exam, the differing level of difficulty, and the obvious mismatch between test questions and course learning outcomes. Briefly said, there had been no formal exam procedure in place during those past years. The department is comprised of teaching staff members who are specialists on their own computing field but mostly have not earned any formal training or education on pedagogy and/or classroom assessment. Their professional teaching knowledge on classroom assessment is greatly influenced by their years of teaching experience. On this regard, some indispensable educational principles and assessment theories have been overlooked or practised by the teaching staff; however, such a gap has been remedied through Staff Development Program offered by the department. A series of awareness sessions with emphasis on test construction, use of Bloom's taxonomy of learning, table of specifications, and moderation procedures had been conducted by the author. From these awareness sessions, seminars, workshops, and symposia, data were also gathered from participants to examine the extent of their assessment knowledge, experience, insights, feedback, and needs to improve exam preparation practices of the department. The insights and feedback generated from them have been used as baseline data for decision-making in revision and simplification of the format of the test blueprint.

To date, three (3) versions of test blueprints have been developed and refined after successive iterations since Academic Year 2011-2012 namely: Version 1 - Paper-Based Test Blueprint Version, Version 2 – Test Blueprint Spreadsheet Prototype, and Version 3 – Simplified Test Blueprint Spreadsheet Version. This paper focuses on the third version of the test blueprint. Interestingly, there has been an obvious transition between and among these versions based on the needs and preferences of the intended users. It has been noticed further that the evolution and development process of the test blueprint of the department has been grounded and iterative as there had been several incremental changes made. This makes it clear that "Pedagogy drives technology

and not vice versa." Interestingly, most of the major issues, concerns, and needs that had been previously raised by the teachers had been adequately solved by the Version 3. Yet to be solved are other issues such as paper wastage and long moderation process. The author believes that other issues and concerns can be solved using another tool such as a Web-Based test blueprint system.
Moreover, the author has been inspired by the words of Newman, Griffin and Cole (1989) who extrapolated that 'descriptions of how a system works are never far removed from questions about how to make it work better'. The author repeatedly searches for an innovation using any conceivable means to improve the existing exam preparation process of the department.

2. REVIEW OF RELATED LITERATURE

2.1 Test Blueprint: Defined

It is difficult to trace the inception of test blueprint; however, the book of Ruch (1924) entitled "The Improvement of the Written Examination" made some arguments that supported objective tests. A test blueprint, which is sometimes called Table of Specifications, Test Specifications, Test Matrix, or Test Plan (Suskie, 2009; Coombe, Davidson, O'Sullivan & Stoynoff, 2012), is a two-way chart (Nortar, Zuelke, Wilson, & Yunker, 2004) that consists of the instructional objectives and its corresponding cognitive level as well as the amount of the test (Nortar et al., 2004) to construct tests more objectively. Various descriptions of a test blueprint are mentioned below:
A test blueprint is an assessment tool which interlinks what is taught and what is tested. It is also a fundamental block in test construction which makes use of the Bloom's Taxonomy of Learning framework, which ensures a fair, complete, valid, reliable, and objective set of test questions (Cruz & Singun, 2014).
A test blueprint shows the structure of a test. It usually includes the content areas along the left side of the table and the cognitive levels are shown on the right side, across the first row of the table. (Suskie, 2009).
Guskey (2005) sees a resemblance between a test blueprint and a travel guide. It helps teachers move students towards the mastery of standards.

2.2 Samples of Test Blueprints

Different versions of Test Blueprints are designed for different purposes (Guskey, 2005; Fives et al., 2013; Alias, 2005). A test blueprint can be simplified or complicated to best meet the needs of the intended users (Fives et al., 2013). Hence, the formats of test blueprints may vary depending on the needs of the institution (e.g., Nortar, Zuelke, Wilson, & Yunker, 2004; Linn & Gronlund, 2000). For instance, a test blueprint can be used for formative assessments (Guskey, 2005) or for summative assessments (Fives et al., 2013; Alias, 2005) such as the format presented in this paper.

2.2.1 Test Blueprint for Formative Classroom Assessments

The sample tabular structure in Table 1 links formative classroom assessment and instruction. The teacher ensures the inclusion of all the learning targets that measure all the important skills and abilities of the students. A formative classroom assessment provides performance feedback on what students have mastered, how much they have learned and have to learn, how well they are learning, and what needs to happen next.

A classroom assessment designed for formative evaluation purposes would look very differently. It would include items that assess students' knowledge of relevant terms, facts, principles, and procedures, as well as other items that measure their skill in translating information into new forms. It would also include constructed or extended-response items that require students to apply their knowledge in using or interpreting maps. Analysis and synthesis skills are tested for higher levels (Guskey, 2005).

Table 1. Tabular Structure of Table of Specifications for Formative Classroom Assessment

Table of Specifications						
Knowledge of				Translation	Application	Analysis & Synthesis
Terms	Facts	Rules & Principles	Processes & Procedures			

Source: adapted from Guskey (2005)

Guskey's test blueprint format presented in Table 1 offers a wide range of cognitive skills to be enhanced, making it more useful as a learning tool. The test blueprint makes a classroom assessment becomes more thorough, complete, and effective at serving their formative purposes (Guskey, 2005). The format indicates a progressive learning spanned in the hierarchy of cognitive levels that is from Lower-Ordered Thinking Skills (LOTS) to Higher-Ordered Thinking Skills (HOTS). Students cannot excel in the high-level items unless they know the requisite facts and principles. These students need to return to activities that help them gain this basic knowledge. In this strategy, teachers could make students reach mastery and/or proficiency in the subject matter.

2.2.2 Test Blueprint for Summative Classroom Assessments

Tables 2 and 3 are used to construct summative tests. Classroom summative assessments have a judgmental purpose given during terminating examination, which is sometimes called accountability-oriented classroom assessment. Assessments should be valid so that the results and observations could be used to drive planning for corrective instruction and decision-making (Stiggins, 2008; Shephard, 2001).

Table 2 ensures that the test measures an adequate sampling of the class content at the cognitive level, the amount of class time spent on each objective is mapped, along with the cognitive level at which each learning objective (LO) is taught thereby helping teachers to identify the types of items they need to include on their tests. Thinking skill which emphasizes recall, memorization, identification, and comprehension, is typically considered to be at a lower level. Higher levels of thinking include processes that require learners to apply, analyze, evaluate, and synthesize (Fives et al., 2013).

Fives and colleagues (2013) believe to the premise that topics that were discussed longer or in greater detail should appear in greater proportion on the test, giving a direct relation between the amount of class time spent on the objective and the portion of the final assessment testing that LO.

The information about the 'Day No.', the 'Instructional Objectives', and the 'Time Spent on the Topic' are taken directly from the teacher's lesson plans and reflective notes. The 'Percent of Class Time on Topic' is a percentage calculation which reflects the percent of total class time for the unit of study that was spent on each LO. The 'No. of Test Items' is the professional decision made by the teacher. The remainders are used to determine how many test items (of equal value) should be used to assess each LO. The teacher must also decide whether the LO should be tested either at a low or high cognitive level of learning. A teacher must decide which type of question to use to assess each LO at the correct level (Fives et al., 2013).

This brings up an important point about constructing classroom tests. Every LO does not need to be assessed in every assessment. A test blueprint can help you make sure that the most relevant LOs are assessed and that a sampling of less prominent ones are also included. A student when preparing for a test studies everything and gains an understanding of the content. What can actually be assessed is only a sampling of the students' knowledge at a particular point (Fives et al., 2013).

Table 2. Tabular Structure of Test Blueprint for Summative Classroom Assessment

	Instructional Objectives	**Time Spent on Topic (minutes)**	**Percent of Class Time on Topic**	**Number of Test Items: 10**	**Lower Levels -Knowledge -Recall -Identification -Comprehension**	**Higher Levels -Application -Analysis -Evaluation -Synthesis**
Day No.					Mark and Type of Test	

Source: adapted from Fives et al. (2013)

Table 3 presented the two-level analysis of a test blueprint designed by Alias (2005). The first level of analysis covers the following: (i) Construct a two-way table with a list of topics in the first column and a list of cognitive emphases in the first row, (ii) Identify the topics/sub-topics and the corresponding cognitive emphasis to be tested, and (iii) Estimate the percentage allocation for each topic. The second level of analysis incorporates the following: (i) Choose the appropriate item format (multiple choice, (MC)/structured question (SQ)/long question or essay (LQ), etc.) for the specific objective, (ii) Determine the number of questions for each specific Objective, and (iv) Check that the marks for each topic match the total weight allocated.

Table 3. Tabular Structure of Test Blueprint for Summative Classroom Assessment

Content	**Cognitive Emphasis**			
	Knowledge & Comprehension	**Application & Analysis**	**Synthesis & Evaluation**	**Total (Content)**
Main Topic	%	%	%	%
Sub-Topic 1	-	Item Format @ Mark each	Type of Exam @ Mark each	%
Sub-Topic 2	Type of Exam @ Mark each	Type of Exam @ Mark each	-	%
Total (Cognitive Emphasis)	%	%	%	%

Source: adapted from Alias (2005)

2.3 Development Framework

As shown in figure 1, the author adopted the 'Interaction Design Model' in the development of a piece of classroom assessment artifact called a Simplified Test Blueprint. This model is a user-centered paradigm of development that involves four stages namely: (i) Establishing Requirement, (ii) Designing Alternatives, (iii) Prototyping, and (iv) Evaluating (Rogers, Sharp & Preece, 2011). Intended users are actively involved throughout the stages, keeping in mind 'the users as the center of the development'. This user-centered approach to development makes all the phases intertwined with each other which may permit the designer to have the opportunity to flashback and address the users' needs and preferences.

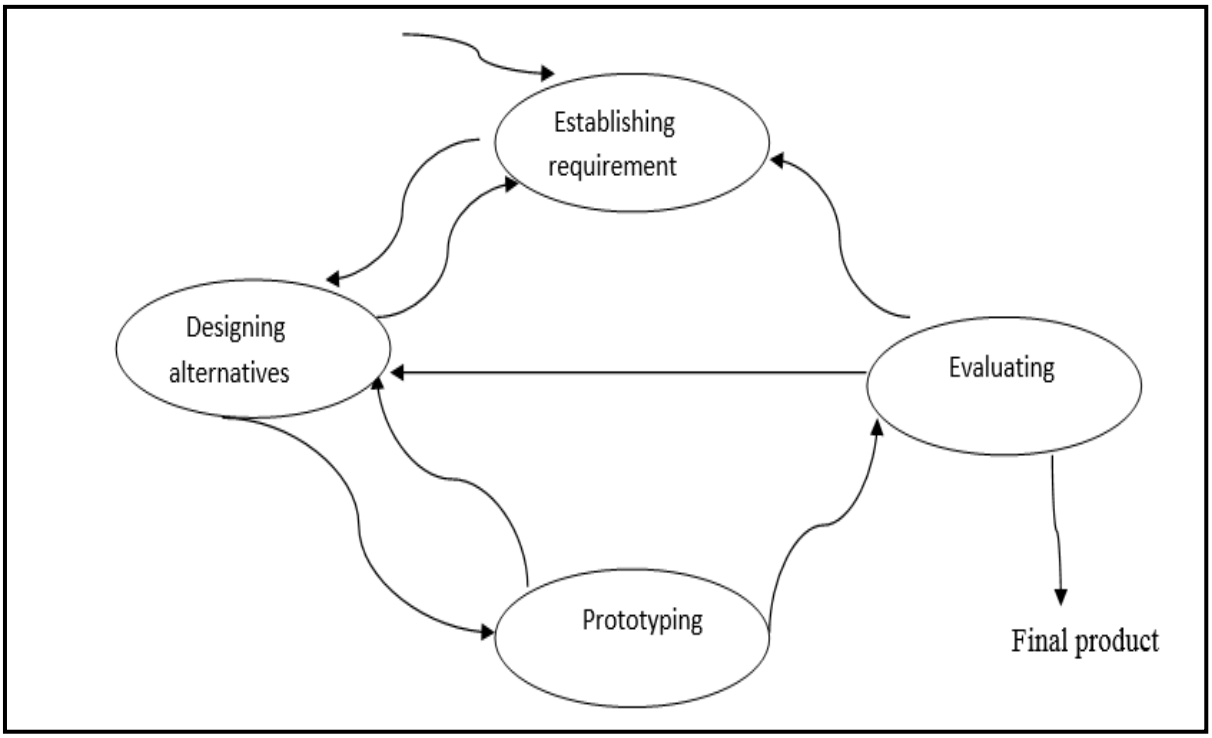


Figure 1. Interaction Design Model
Source: adapted from Rogers et al. (2011)

The author explains below how the simplified test blueprint classroom assessment artifact has been developed using the four (4) stages of the interaction design model:

1. **Establishing Requirements.** There is constant and systematic searching of pieces of evidence through multiple sources of information to form requirements. Researching similar product/artifact/system, literature reviews, mandatory user participation, and established principles and theories are some of the activities under this stage.
2. **Designing Alternatives.** Alternatives are considered at every point of the system's development. This is the core activity of designing a piece of artifact that is coming up with a number of creative ideas that meet the users' requirements.
3. **Prototyping.** Prototyping allows a designer to better understand users' real needs and preferences. This is the most sensible way for users to evaluate system's design through interaction with the prototype.
4. **Evaluation.** The goal of evaluation is to uncover and fix any usability problems that users may encounter. When a system or product or any piece of artifact has been evaluated and found to be up-to-acceptable-level, then it has to be finally released for use among the intended users. However, evaluation is an ongoing process that sustains the usability and acceptability levels of the system/product/artifact. If some requirements or elements are missing or require improvement then these are fed back and shall be addressed in the preceding stage(s).

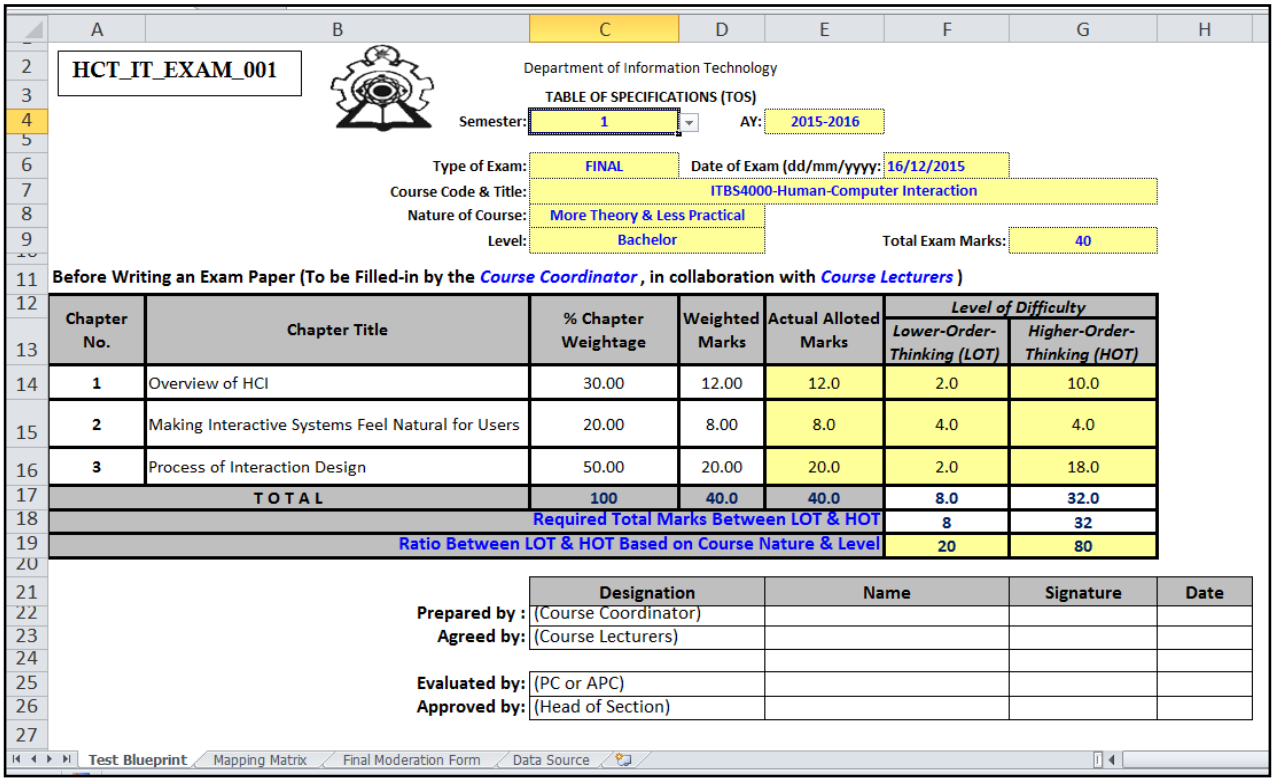
The intended users of the test blueprint had been consulted to form the initial set of requirements. Early versions form as bases in the succeeding improved versions. Each version had undergone repeated evaluations and redesigning throughout the interaction design life cycle. Based on the needs of the intended users as revealed on the users' requirements and preferences, suggested formats and functionalities had been designed, re-designed, and prioritized. Iterative design after several rounds of testing had been a continuous process.

Designing a test blueprint greatly relies on the insights and feedback of the intended users. Their roles are interplayed in a collaborative manner in order to come up with a consensus of feedback as basis in decision-making. Throughout the development of a test blueprint, there has been a great

deal of time and effort in coding and decoding feedback, brainstorming for and against the applicability of established standards, underlying practices and procedures, interpreting and analyzing user requirements, executing trial-and-error, pilot testing, and much of scaffolding and offering of support among the stakeholders.

2.4 The Simplified Test Blueprint: An Application-based System

Using the interaction design model, the author designed the simplified test blueprint as shown in figure 2. This is an application-based test blueprint designed for a summative classroom assessment which is a tool that facilitates in the measurement of the students' achievement more objectively and which examines the extent of students' knowledge and skills at the end of a learning period. The test blueprint was developed using a spreadsheet that contains four (4) different interlinked worksheets: the Test Blueprint (refer to Table 1), the Mapping Matrix (refer to Tables 2 and 3), the Final Exam Moderation Form, and the Data Store that stores pre-defined data which shuns the user to perform the inefficient and manual task of keying required data.



HCT_IT_EXAM_001

Department of Information Technology

TABLE OF SPECIFICATIONS (TOS)

Semester: 1 AY: 2015-2016

Type of Exam: FINAL Date of Exam (dd/mm/yyyy): 16/12/2015

Course Code & Title: ITBS4000-Human-Computer Interaction

Nature of Course: More Theory & Less Practical

Level: Bachelor Total Exam Marks: 40

Before Writing an Exam Paper (To be Filled-in by the *Course Coordinator*, in collaboration with *Course Lecturers*)

Chapter No.	Chapter Title	% Chapter Weightage	Weighted Marks	Actual Alloted Marks	Level of Difficulty	
					Lower-Order-Thinking (LOT)	Higher-Order-Thinking (HOT)
1	Overview of HCI	30.00	12.00	12.0	2.0	10.0
2	Making Interactive Systems Feel Natural for Users	20.00	8.00	8.0	4.0	4.0
3	Process of Interaction Design	50.00	20.00	20.0	2.0	18.0
TOTAL		100	40.0	40.0	8.0	32.0
	Required Total Marks Between LOT & HOT				8	32
	Ratio Between LOT & HOT Based on Course Nature & Level				20	80

	Designation	Name	Signature	Date
Prepared by :	(Course Coordinator)			
Agreed by:	(Course Lecturers)			
Evaluated by:	(PC or APC)			
Approved by:	(Head of Section)			

Test Blueprint | Mapping Matrix | Final Moderation Form | Data Source

Figure 2. Test Blueprint

Source: author

2.4.1 The Test Blueprint

The test blueprint should be filled-in by the course coordinator, in collaboration with the course teachers. They are collectively known as Subject Matter Experts (SMEs).

- ***Chapter no. and chapter title.*** There should be an adequate coverage of course outcomes. The SMEs identify what chapters to test. These chapters have sub-topics that are mapped against the course learning outcomes. It is a common knowledge that students are tested to achieve the course learning outcomes in order to ensure that they gain learning. Suskie (2009) puts it that most direct evidence of student learning is focused on learning outcomes.
- ***% Chapter weightage.*** Course learning outcomes are taken into consideration when the SMEs are assigning the percentage of chapter weight of each chapter. The expert knowledge of the SMEs takes note the significance of each course learning outcome when assigning the

percentage as there are some course outcomes that had already been previously tested which are supposed to be evaded to be tested over and over again unless required by the SMEs. The author cites an exception to the idea set forth by Fives and colleagues (2013) regarding the direct relation between the amount of class time spent on the objective and the portion of the final assessment testing that objective. In this test blueprint, the SMEs do not wish to include a greater percentage of weight on the topics that are merely introduction or fundamentals as there is a need to test more deeply the more advanced topics. The author of this paper believes that, ideally, basic topics or introductory topics took much longer time to discuss than the rest of the topics because foundation topics are building blocks to study advanced topics.

- ***Weighted marks.*** When the SMEs enters the percentage of chapter weight in relation to the significance of the course outcomes, the spreadsheet automatically computes the weighted marks using the formula: (% Chapter Weightage / 100) * Total Exam Marks. In other words, the weighted mark is the corresponding value of the % chapter weightage.
- ***Actual allotted marks.*** Weighted marks may sometimes bear decimal values so the SMEs are given the flexibility to either round-up or round down the weighted marks.
- ***Level of difficulty.*** LOT-HOT ratio of each course is pre-defined based on the nature and level of the course. The level of difficulty of each chapter is described by such ratio. The required LOT value is automatically derived using the formula: (LOT Ratio/100) * Total Exam Marks. Similarly, the required HOT value is computed using the formula: (HOT Ratio/100) * Total Exam Marks. Generally, LOT consists of easier and moderately constructed question items than HOT that are designed for more challenging questions.

The author of this study believes that teachers should challenge the students to use a variety of ways of thinking and learning, preferably the HOT which include critical thinking skills resulting to a lasting learning retention. High level cognitive processing engages students into a deeper approach of learning.

To strengthen accountability of the Final Exam Procedure of the department, a set of signatories for agreement, evaluation, and approval of the test blueprint has been shown at the bottom of the worksheet.

2.4.2 The Mapping Matrix

Upon approval of the test blueprint, the mapping matrix has to be completed before writing the test questions of the exam paper. The SMEs should design it according to the approved test blueprint.

- ***Type of exam.*** This refers to the different formats of test questions such as Multiple Choice, Short Answers, Modified True or False, Case Study, Application Items, Essay, and many others. Fives and Barnes (2013) said that "all types of item formats can be used to assess thinking at both high and low levels depending on the context of the question." Shepard (2001) once claimed that classroom assessments must reflect the thinking and learning processes of the subject matter.
- ***Section.*** The total number of types of exam is the total number of sections of the exam. For instance, if the SMEs have decided to give three test formats or types of exam (i.e. Multiple Choice, Short Answer, and Application Items) then there exist three sections that appear on the exam paper later on. Under each section, the Question Number, the Chapter Number, the Bloom's Cognitive Level, and the Total Marks are specified.

1	Type of Exam:	MULTIPLE CHOICE			
2		Q.No.	Chapter No.	Cognitive Level	Total Marks
4	Section A	1	1	Knowledge	1
5		2	1	Knowledge	1
6		3	1	Analysis	1
7		4	1	Evaluation	1
8		5	1	Analysis	1
9		6	1	Analysis	1
10		7	1	Analysis	1
11		8	1	Analysis	1
12		9	1	Analysis	1
13		10	1	Evaluation	1
14		11	1	Analysis	1
15		12	1	Analysis	1
16	Type of Exam:	SHORT ANSWERS			
17	Section B	1a	2	Comprehension	1
18		1b	2	Comprehension	1
19		1c	2	Comprehension	1
20		1d	2	Comprehension	1
21		2	2	Analysis	2
22		3	2	Comprehension	2
23		4	2	Application	1
24		5	2	Analysis	1
25	Type of Exam:	APPLICATION ITEMS			
26	Section C	1a	3	Application	0.5
27		1b	3	Application	0.5
28		2	3	Application	6
29		3	3	Application	3
30		4	3	Application	5
31		5	3	Application	3

Test Blueprint | Mapping Matrix | Final Moderation Form | Data Source

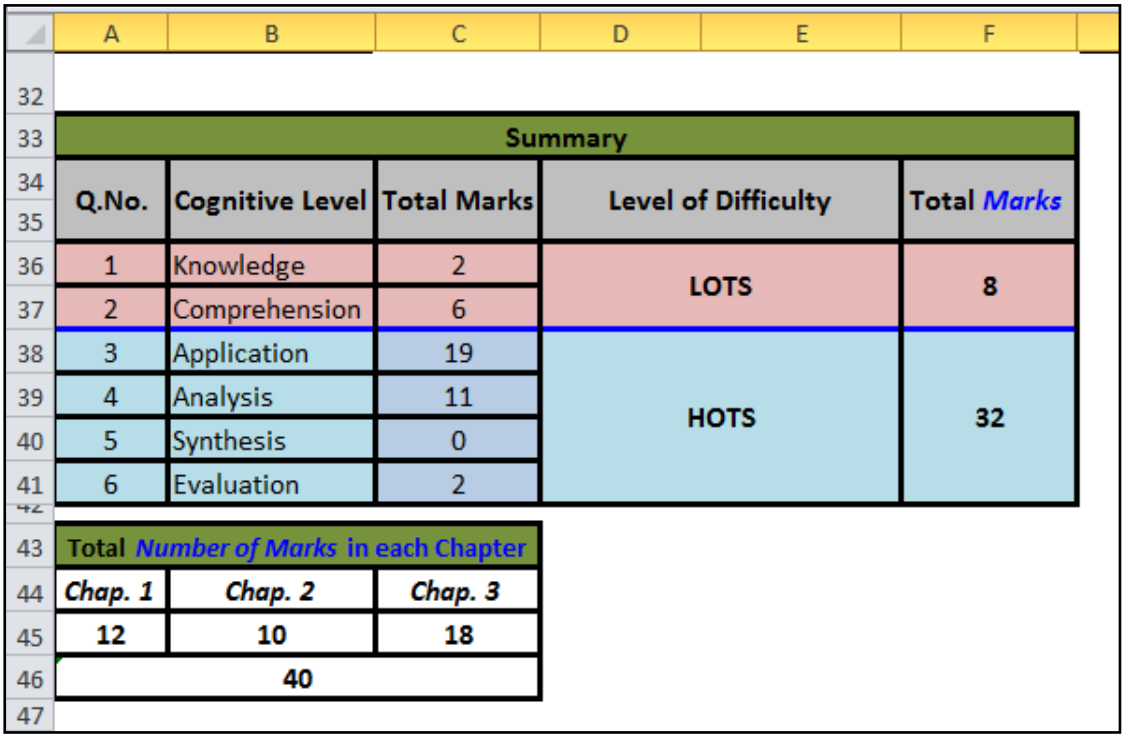
Figure 3. Mapping Matrix
Source: author

- ***Question number and chapter number.*** The question number, otherwise known as the question item, is entered indicating the corresponding Chapter Number that the question number pertains to.
- ***Cognitive level.*** The author emphasizes that the Taxonomy of Learning is very essential in test construction (Bloom, et al., 1956). The test blueprint focuses on the cognitive domain which refers to the knowledge development that enables the teacher to check if the students have the ability to exhibit their acquired knowledge. Despite the revisions on the taxonomy made in the mid-nineties (Anderson, Krathwohl, Airasian, Cruickshank, Mayer, Pintrich, Raths & Wittrock, 2001), Bloom's taxonomy is still the most widely applied one in use today. The six principal levels of the cognitive domain are (i) Knowledge, (ii) Comprehension, (iii) Application, (iv) Analysis, (v) Synthesis, and (vi) Evaluation (Bloom, et al., 1956). The cognitive levels of the Bloom's Taxonomy of learning are sequential and hierarchical which means that the higher level accumulates the knowledge and skills that are previously acquired. In other words, each level is a subset of the higher level (Junoh, Muhammad, Ghazali, Jaafar, Saad & Aluwi, 2011). For example, initially students have to recall or remember key notes before they could understand a concept. Similarly, students have to understand the concept first before the teacher asks them to apply the theories learned and so on.

  The cognitive domain of the Taxonomy of Learning is subdivided into two partitions: (i) the Lower-Ordered Thinking Skills (LOTS) which comprises of the Knowledge and Comprehension and (ii) the Higher-Ordered Thinking Skills (HOTS) which comprises of the Application, Analysis, Synthesis, and Evaluation. Some studies include the Application as

part of the LOTS. However, it is the discretion of the institution to categorize Application in either LOTS or HOTS categories. Junoh and colleagues (2011) claim that Application level often falls into both categories.

- ***Total marks.*** The total mark refers to the weight of each question number. The total mark of each item may differ from one item to another, depending on the difficulty of the given question item. Marking the exam paper should be based on a Rubrics System, as and when required.
  Under the Mapping Matrix is an automatic list of summary details such as (i) the overall total marks that are accumulated by each cognitive level, (ii) the overall total marks of the LOT and HOT ratio, (iii) the overall total marks allocated in each Chapter, and (iv) the overall total Exam Mark. Any discrepancies of entries in the Mapping Matrix against the Test Blueprint found in the first worksheet are marked in red as hints or warnings that require attention. Comments in each cell are also inserted as forms of feedback in order to guide the user while working on the mapping matrix.



Summary				
Q.No.	Cognitive Level	Total Marks	Level of Difficulty	Total *Marks*
1	Knowledge	2	LOTS	8
2	Comprehension	6		
3	Application	19	HOTS	32
4	Analysis	11		
5	Synthesis	0		
6	Evaluation	2		

Total *Number of Marks* in each Chapter		
Chap. 1	*Chap. 2*	*Chap. 3*
12	10	18
40		

Figure 4. Summary of Test Blueprint and Mapping Marix
Source: author

When the SMEs have completed the Mapping Matrix, the next step is to write the question items of the Final Exam paper that should be in perfect harmony with the test blueprint and mapping matrix that had been previously completed and approved. During the Final Exam Paper moderation, exam moderators are particularly meticulous on how each question item is constructed based on the test blueprint and the mapping matrix. A final exam moderation form is used for this purpose.

4. CONCLUSION AND FUTURE RESEARCH WORK

The author introduces a simplified test blueprint to be utilized as a tool in preparing a summative classroom assessment. A test blueprint is a cornerstone of quality classroom assessment which ensures that student learning is based on empirically tested evidence. The test blueprint was

designed using a paradigm called "Interaction Design Model". The simplified test blueprint that has been presented in this paper could help other institutions to design their own format that could effectively fit their own needs and preferences. Teachers are the key people that could make or unmake a difference on the learning experience of the students. Along with this line, there should be an adequate training and exposure on the processes of assessment within the institution of higher education so that classroom assessment will enhance, not impede, learning-teaching process. In this paper, it has been discussed that SMEs have collaborated to structure the exam paper. However, the author also urges the teachers to collaborate with students in the creation of a test blueprint. This is an effective way of communicating and understanding the learning expectations and methods of assessment that could help students to better perform in the examination.

What have already been known about the topic of this paper include: (i) the Assessment as an integral and vital part of the teaching-learning process, (ii) the definition of assessment, classroom assessment, and formative and summative assessments, and (iii) the achievement of course learning outcomes as an assurance of students' learning.

What this paper adds are the following: (i) the use of a user-centered approach of development, otherwise known as Interaction Design Model, in the area of education, (ii) the suggested format of an application-based test blueprint used for a summative classroom assessment, (iii) the automation of the process of test construction using a spreadsheet, (iv) the opposing stand or exception to the idea that there exists a relationship between the time spent for a particular topic and the proportion of test items, (v) the teachers' knowledge on classroom assessment being influenced by the years of experience in teaching, sharpened through Staff Development Training Opportunities, and (vi) the teachers' required competency on professional teaching knowledge and skills on classroom assessment.

The implications for practice and/or policy of this paper are the following: (i) the elimination of the inefficient and repetitive manual test construction, (ii) the quality exams as a result of using a test blueprint, (iii) the well-prepared and valid assessments resulting to students' valid GPAs that keep graduates employed and employable, (iv) the building of confidence and trust among stakeholders (such as students, administration, parents, employers, industries, and the general public) through the impressive high quality exams, (v) the academic standards on assessment which may affect the national socio-economic stability, and (vi) the technology-driven test construction procedures that promote a clean and green environment.

Future research for this paper may include the following, but not limited to: (i) the development of a web-based test blueprint, (ii) the innovation of test blueprint in the cloud, or (iii) the integration of test blueprint in mobile or ubiquitous setting of learning. However, regardless of what tool is used in the preparation of classroom assessment, it is noteworthy that the evidence of student learning of a summative classroom assessment should be used and reused for the improvement of instruction, curriculum, or academic processes of the institution.

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