Polishing exam designing skills among academics using Scientific, Educational, Linguistic, and Formative (SELF) evaluation strategy

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Abstract: The purpose of this study was to provide academics with multiple tools essential for designing robust multiple choice questions (MCQs) exams. A package of tools, including but is not limited to MCQs checklist, SELF evaluation strategy diagram, global blueprint, blueprint matrix, in addition to difficulty and discrimination index were introduced to academics. A series of training sessions were carried out and a formal feedback obtained from participated academics. Results showed that 78% of participated academics reported that the academic tools were of great help in perfecting exam designing skills. Only 22% reported that they have some difficulties particularly with the indices since it requires good knowledge of statistics. It is recommended to market the package of exam designing tools among academics to have robust, well designed exams that based on the best scientific evidence as well as the critical thinking skills.
Key words : Blueprint, SELF evaluation, MCQ, difficulty index, discrimination index.

Introduction

The explosion of knowledge in the recent years have imposed great burden on academics to keep up with the fast pace of creation of new knowledge.[1] Academics are facing huge challenge starting from designing academic courses, teaching the related topics, and ending with designing robust exams that capable of discriminating more capable from less capable learners.[2-6]It is unknown if academics visit specific sources to make sure that the exams questions have satisfied the psychometric measures necessary to administer the multiple choice questions (MCQs) exams with full faith.[7] There is a gap in the body of knowledge regarding having specific predesigned templates that can be directly used by academics to design robust MCQs exams. We hypothesize that the predesigned academic templates recently published by Dr. El-gohary will be the cornerstone for designing robust MCQs exams.[2-4]The objective of this educational paper isto explore academics feedback after providing and training them on using the academic tool package.

Materials and Methods

A package of tools, including but is not limited to, MCQs checklist (Table I), SELF evaluation strategy diagram (Figure 1), global test blueprint (Table 2), Dr. El-gohary blueprint matrix (Appendix I), in addition to difficulty and discrimination index template (Appendix II) were introduced to academics.[2-4] A series of training sessions were carried out over eight- week period. A total of nine academics who participated in the current study were instructed to choose one of their core courses and gradually step by step apply the included academic tools and consult Dr. El-gohary to amend any incorrect items. An initial, formative, and summative feedback obtained from participated academics. Academics were encouraged to consult Dr. El-gohary using phone calls, one to one interview or small group discussion. Academics were provided with the original educational papers authored by Dr. El-gohary to facilitate understanding the details and proper application of the included academic tools. Participated academics were encouraged to bring any academic tools that are readily used by them during designing the MCQs exams. For the purpose of discussion we will include the global test blueprint for the biomechanics and kinesiology of the first year.[3] The global test blueprint will show the content area and the number of questions that reflect the percentage of total weightage and percentage of different educational levels of Bloom's taxonomy.[3]

Table 1. The ten points checklist for creating quality MCQ exam items:

1. **Questions must be correct from scientific, educational, linguistic and formative perspectives,**

2. **Short and long clinical case scenario are always encouraged,**

3. **Avoid verbiage and have the narrative part in the question body not the answers,**

4. **Avoid recalling and encourage clinical reasoning,**

5. **Avoid all of the above or none of the above,**

6. **Answer options should have the same length,**

7. **Avoid double negatives and absolutes such as never or always,**

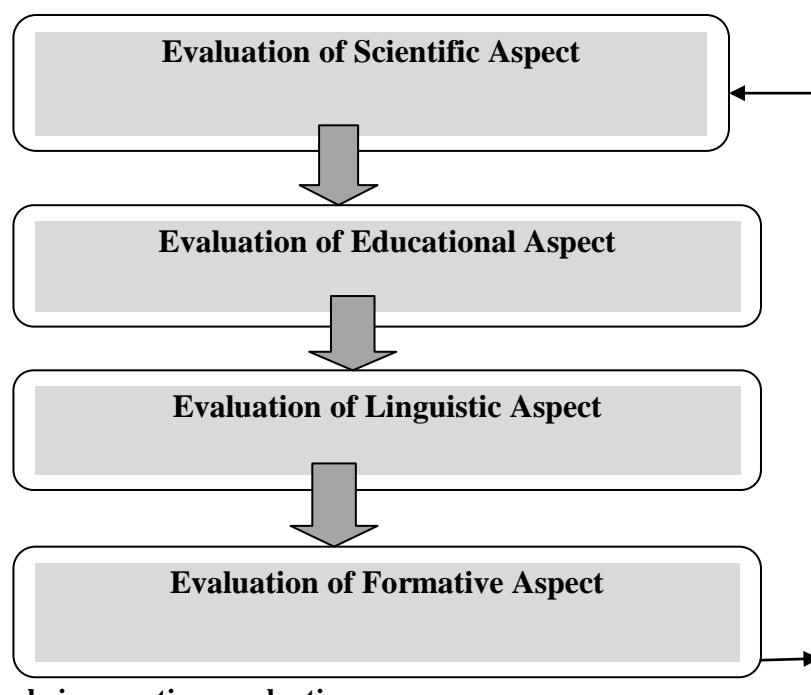8. **The alternatives must be grammatically parallel with each other, and consistent with the stem,**

Figure1. The multiple choice questions evaluation process.

Table 2. Global test blueprint for the biomechanics and kinesiology of the first year

Content Area	Total Weightage (%)	Recall (%)	Interpretation (%)	Problem Solving (%) "Apply, analyze, evaluate, Synthesize"
Introduction/ SI units, Planes& Axes Arthrology	5	1	2	2
Static Equilibrium	4	2	0	2
Scalar and Vectors Resolution of Forces	7	2	1	4
Muscle Mechanics	7	1	2	4
Tissue Mechanics	5	1	1	3
Mechanics of Exercise Prescription	7	1	1	5
Kinesiology of the Shoulder	9	1	2	6
Kinesiology of the Elbow& Forearm	6	1	1	4
Kinesiology of Hand& Wrist	7	1	1	5
Kinesiology of the Hip	7	1	1	5
Kinesiology of the Knee&Patello-Femoral Joint	9	1	1	7
Kinesiology of the Foot& Ankle	6	1	1	4
Introduction to Gait Analysis	6	3	3	0
Gait Analysis	7	2	2	3
Miscellaneous	(8)	(1)	(1)	(6)
Total	**100%**	**20%**	**20%**	**60%**

Appendix I
*Subject's Name & No:**Biomechanics and Kinesiology**

		Acquisition of knowledge as hierarchy of Bloom's Taxonomy							
		Knowledge Recall % Identify-Label	Comprehension Interpret % Describe- Explain	Application Demonstrate % Calculate- illustrate	Analysis Formulate% Discuss- Solve	Evaluation Appraise % Judge- Estimate	Synthesis Integrate % Create-Write		
		( )	( )	( )	( )	( )	( )		
									Sum
( )	Topic 1								
( )	Topic 2								
( )	Topic 3								
( )	Topic 4								
( )	Topic 5								
( )	Topic 6								
( )	Topic 7								
( )	Topic 8								
( )	Topic 9								
( )	Topic 10								
( )	Topic 11								
( )	Topic 12								
( )	Topic 13								
( )	Topic 14								
( )	Topic 15								
Total ( )		Sum=	Sum=	Sum=	Sum=	Sum=	Sum=		Total=

Q_n; Question number

Instructions: Start by filling up the parentheses with the number of question that correspond to the percentage required by 1) different levels of Bloom's taxonomy; 2) the topics weight as a % of total course time; 3) the intended learning outcomes. See the next equations.
(Total number of exam questions) X (% of topic weight) and/or (Total number of exam questions) X (% of Bloom's taxonomy)
N.B.MCQ, case scenario MCQ[*], and short essay[**] are encouraged. Have the subject and the program intended learning outcome available before you.

Appendix II:

Examiner's Name: Date:

Difficulty Index& Discrimination Index			
Subject Title:			
Subject #:Xxxx			
Discrimination Index	**Difficulty Index**		
	HARD (0- 0.29)	**MEDIUM** (0.30- 0.79)	**EASY** (0.80- 1)
	Question Numbers		
Poor< 0.1			
Fair 0.1 to 0.29			
Good> 0.30			
To be avoided	Acceptable		Good

<u>*NB*</u>. **Discrimination index of ≥ 0.2 is desirable and difficulty index around 0.5 is also desirable.**

Results

Results showed that seven (78%) of participated academics reported that the academic tools were of great help in perfecting exam designing skills. Only two academics (22%) reported that they have some difficulties particularly with the difficulty and discrimination indices. Novice academics requested more one to one interview consultation with Dr. El-gohary.

Discussion

The findings of the present educational study showed great satisfaction among academics regarding the feasibility of using the included academic tool package in designing their MCQs exams. The majority of participated academics are in agreement that they used to rely on their self- experience in designing the MCQs exams particularly in the absence of specific reliable academic sources.[8-10] Participated academics indicated that the available sources are very poor and could be considered as general advices more than specific steps to guide academics.[5,11]MCQs exams are the gold standards for knowledge acquisition and should be carefully designed to discriminate more capable from less capable learners.[2-4]MCQs are commonly used for testing both of undergraduate as well as postgraduate professionals.[12,13]Academics need to design MCQs exams that build competence and capabilities.[14-16] Therefore, questions should reflect lower and higher order thinking skills.[17-20] Novice academics must consult academics with good experience while constructing the MCQs exams to avoid writing flaws and satisfy the psychometric measures.[8,21,22] Academics must align intended learning outcomes with the teaching strategy and assessment techniques.[23]Academics should have a mix of short case scenarios, clinical vignettes, and stand- alone MCQs.[12]Academics should educate learners for capability through emphasis on critical thinking skills.[18,19]Post graduate professionals looking for board speciality certification should enjoy distinguished clinical reasoning and clinical judgment skills under umbrella of critical thinking in order to achieve the passing score.[13,18,19] Academics are in consensus that the recently published educational papers by Dr. El-gohary serve as the cornerstone for designing robust MCQs exams.[2-4]Novice and inexperienced academics support the notion of mandatory training to develop exam designing skills.[4,6] They unveil that the oversight of academic training is mainly due to lack of experts that can develop exam designing skills among academics leaving everyone to rely on his/her own experience. It is recommended to market the package of exam designing tools among academics to have robust, well designed exams that based on the best scientific evidence as well as the highest critical thinking skills.

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