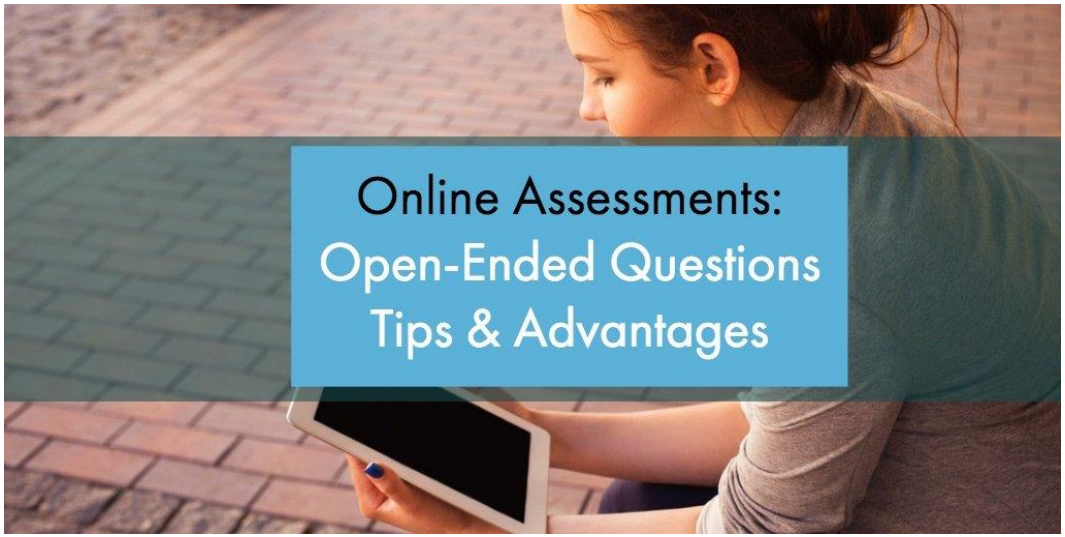

open-ended questions require complex thinking and produce a variety of solutions (Badger 1992)

Finkel (2000) states specifically that open-ended question should be like the parable of the puzzle that intrigue the mind, but also challenging enough so that students would be interested in the answer.

Badger, E., B. Thomas, (1992). Open-ended questions in reading. Practical Assessment, Res. and Evaluation, 3(4).
Finkel, D.L., (2000). Teaching with Your Mouth Shut. Boynton/Cook Publishers.

The Features of Open-ended Questions (Felder, 1987).

Open-ended questions should be able to challenge the students

- to demonstrate a deep understanding of the materials being studied,
- the ability to use techniques from other disciplines, and
- the ability to assess the value of design, product, or system

Felder, R. M. (1987). On Creating Creative Engineers. Engineering Education, 77(4), 222-227.

The Features of Open-ended Questions

Cooney et al (2004) stipulates that the open-ended question should include the following features:

1. **Authentic (real-world) Problem Solving**
2. **Require Multiple answer**
3. **Require Reasoning**
4. **Clearly Stated**
5. **Scoring Rubric (multiple point)**

1. IT INVOLVES A SIGNIFICANT CONCEPT IN A RELATED FIELD.

The assessment items conveyed to the students what needs to be emphasized and what is important.

It involves giving students the chance to display their understanding by linking the entire topic and how it can lead to real world problem solving (authentic).

The Features of Open-ended Questions

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2. THERE COULD BE MULTIPLE ANSWERS TO OPEN-ENDED QUESTIONS.

When a question requires one correct answer, students often conclude there is only one way to solve the problem.

Questions that require students to explain their thinking will encourage a variety of responses or reactions because not all students think the same.

For example, can an equilateral triangle have right angle? If yes, explain your reasons. Typically, students focused on the angle and concluded that it is not possible, because all the sides of an equilateral triangle must have the same length and an equilateral triangle cannot have 270 degrees.

But one student replied that no, because if it has a right angle it will have a hypotenuse. And it will become the longest side. But since all sides are of the same length so it cannot happen

The Features of Open-ended Questions

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3. NEED TO COMMUNICATE THE REASONING PROCESS.

One strong point of using open-ended questions is that students are given the opportunity to communicate what is in their minds

Example
Mary claimed that the area of any 30-60-90 triangle can be calculated even if only one side of the given length. Is Mary right or wrong? Explain your answer.

Here is an answer given by students: Mary is right. If you know the length of one side, you can divide or multiply with 3 or 2. After that, the height is multiplied with the base, divide by 2, and you will get the answer.

Another student gave the following response: Mary is wrong. Since all the angles are different, then all the sides are of different length. By knowing only one side initially, you would need to know the length of the other two sides (height and base) to calculate the area of the triangle.

The first student sees the relevance relations among the sides of the triangle 30-60-90, while the second student who may not realize this, does not see the relevance context of this problem.

When students are required to communicate their reasoning process, it was easy to understand what they know and they can use this to solve the given problem

The Features of Open-ended Questions

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4. Clearly Stated
5. Scoring Rubric (multiple point)

4. OPEN-ENDED QUESTIONS SHOULD BE CLEARLY STATED.

The fact is that open-ended questions should not be incomprehensible.
These types of questions should have a clear purpose even if there are many different answers.
In addition, students need to know what is expected of them and what lecturers consider as a good and complete response.

Many lecturers find that sharing a variety of answers with their students and asked them to evaluate these responses helped the students to determine what constitutes a good response.

This is because students are often not used to explain their thoughts in writing and it is important to help them to improve their communication, analytical and critical thinking skills.

The Features of Open-ended Questions

Cooney et al (2004) stipulates that the open-ended question should include the following features:

1. Authentic (real-world) Problem Solving
2. Require Multiple answer
3. Require Reasoning
4. Clearly Stated
5. Scoring Rubric (multiple point)

5. HAVE A SCORING RUBRIC.

Each item evaluated must have at least a 3-4-points rubric

But the purpose of the open-ended questions is to provide students with the opportunity to communicate their understanding in something other than the scenario of exactly right or wrong answer.

To give students partial credit is a common perception, and using the rubric to formulate the process helps to ensure fairness.

One of the features for a good open-ended question is to get the answer that agrees with the partial credit as defined by the rubric. As an example in the question of whether an equilateral triangle have a right angle?

Answer yes or no does not involve a partial credit, but the answer to why will allow a partial credit to be given.

Table 1. Open-ended question as modified from the closed-ended question

Example of closed-ended questions	Modified to open-ended questions
Which of the following numbers are prime? 7, 57, 67, 117	*Fred thinks that 57 and 67 are prime because they both end in 7, which is a prime number. Dick says he is wrong. Who is correct and why?*
What are the next three numbers in the following sequence? 1, 4, 7, 10, 13, ___, ____, ____	*Consider the following sequence: 1, 4, 7, 10, 13, ... Is 100 a member of this sequence? Explain your reasoning.*
Round 37.67 to the nearest 10th.	*Generate three different numbers that when rounded to the nearest 10th give 37.7.*
Find the LCM of 18 and 24	*Why can't 48 be the LCM of 18 and 24?*

Boaler, J. (1998). Open and Closed Mathematics: Student Experiences and Understandings. J. for Res. in Math. Ed., 29(1), 41-62

a) *Determine the optimum solutions at the end user level for improving overall voltage sag performance and reliability.*

b) *Design a simple test distribution system for the customer facility as shown in Figure 2. PCC-1 is the utility bus at 13.8 kV and PCC-2 is the customer bus at 480 V. The data of PCC-2 bus are as follows:*

$Tr_1 = 1000\ kVA$, *5.0% impedance on 1000 kVA base*

$I_{load} = 1000\ A$

The measured distortion is equal to 90 A at 5th harmonic and 44 A at 7th harmonic. The short circuit impedance on 13.8 kV bus is equal to 1.7% on 1000 kVA base.

(b) Question 2

Noncompliance

1. **Authentic (real-world) Problem Solving**
2. ~~**Require Multiple Answer**~~
3. ~~**Require Reasoning**~~
4. **Clearly Stated**
5. **Scoring Rubric (multiple point)**

Table 2. Qualitative analysis of open-ended questions that met the feature

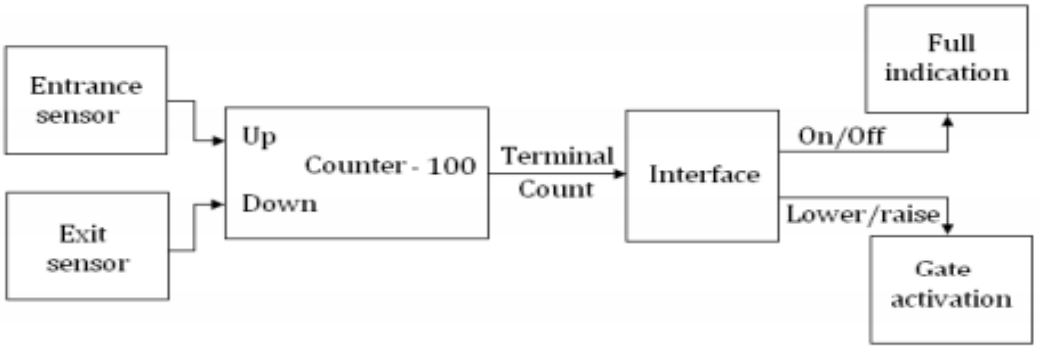
Question	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5
1	√	x	x	√	y
2	√	Part a) √	Part a) √	√	y
		Part b) x	Part b) x	√	y
3	√	Part a) x	Part a) x	√	y
		Part b) √	Part b) √	√	y
		Part c) √	Part c) √	√	y
		Part d) x	Part d) x	√	y
4	√	Part a) √	Part a) √	√	√
		Part b) √	Part b) √	√	√

HafizahHusain, BadariahBais, AiniHussain& Salina AbdulSamad (2012). How to Construct Open Ended Questions. How to Construct Open Ended Questions. https://www.sciencedirect.com/science/journal/18770428

spaces in a one-hundred space parking garage and provide an indication for a full condition by illuminating a 'FULL' display sign and lowering a gate bar at the entrance. Optoelectronic sensors are used at the entrance and exit of the garage, an up/down counter and associated circuitry is used to count the number of parked cars and parking space available and an interface circuit that uses the counter to turn the 'FULL' sign on or off as required and lower or raise the gate bar at the entrance. The general block diagram is as shown in Figure 7. Unfortunately, one day, patrons complained that when they enter the garage (the gate was raised and the 'FULL' sign was off), and yet they can find no empty space.

a) As the technician in charge of this facility, Discuss with examples and illustrations, if any, what and where do you think the problem is.

b) Explain on the troubleshooting procedure and how will you troubleshoot and repair this system as quickly as possible



1. Authentic (real-world) Problem Solving
2. Require Multiple Answer
3. Require Reasoning
4. Clearly Stated
5. Scoring Rubric (multiple point)

(d) Question 4

Table 2. Qualitative analysis of open-ended questions that met the feature

Question	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5
1	√	x	x	√	y
2	√	Part a) √	Part a) √	√	y
		Part b) x	Part b) x	√	y
3	√	Part a) x	Part a) x	√	y
		Part b) √	Part b) √	√	y
		Part c) √	Part c) √	√	y
		Part d) x	Part d) x	√	y
4	√	Part a) √	Part a) √	√	√
		Part b) √	Part b) √	√	√

HafizahHusain, BadariahBais, AiniHussain& Salina AbdulSamad (2012). How to Construct Open Ended Questions. https://www.sciencedirect.com/science/journal/18770428

It is recommended that the open-ended questions posed in the final examination should consist of 10 to 20% of the total marks(40%)

HafizahHusain, BadariahBais, AiniHussain& Salina AbdulSamad (2012). How to Construct Open Ended Questions. https://www.sciencedirect.com/science/journal/18770428

Malaysian Education Blueprint 2015-2025_HOTs

Take Home Exam
Open Book Exam
Extended Time

It is recommended that the open-ended questions posed in the final examination should consist of 30% of the total marks (40%)

4

Balance, Fair, Representative

TEST BLUEPRINT			
SCHOOL & FACULTY	School of Education Faculty of Social Sciences and Humanities		
NAME			
COURSE		CODE :	
SECTION		SESSION	

No.	TOPIC/SUBTOPIC	Objective Items (O) Essay Items (E)	CLO	PLO	COGNITIVE LEVELS						Total
					Remember	Understand	Apply	Analyze	Evaluate	Synthesize / Create	
1	Measurement Data (Nominal, Ordinal, Interval, Ratio) Types of Scales	E	1	1	1 (i)-3m	1(ii)-4m	1(iii)-3m				
2	Instrumentation Plan Instrument Development Process Instrument Conceptualization	E	1	1		2(i)-3m		2(ii)-3m	2(iii)-4m		
3	Item Construction	E	1	1					3(i)-5m	3(ii)-5m	
4	Pilot Test Validity Reliability	E	1	1		4(i)-3m		4(ii)-3m	4(iii)-4m		
10	Data Analysis and Interpretation	E	1	1			5(i)-2m	5(ii)-4m		5(iii)-4m	
	Total				3	10	5	10	13	9	40
	Percentage (%)					18%			22%		100 %
						LOTs			HOTs		

Prepared By:

Date:

Revise the Test Blueprint

10%

30%

6 → Send to Panel Review for Improvement

7 → Revise

8 → Send to Director to endorse

Validity & Reliability Compliance

MPPR1333
Introduction to Scaling and Instrumentation

UNIVERSITI TEKNOLOGI MALAYSIA
FAKULTI PENDIDIKAN

FINAL EXAM
(TAKE HOME EXAM)

SEMESTER II SESSION 2020/2021

INTRODUCTION TO SCALING AND INSTRUMENTATION

Five Hours

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

Instructions:

1. This paper consists of **thirty (30) multiple choice** questions.
2. Answer **all** questions in teh answer sheet given.

Q&A