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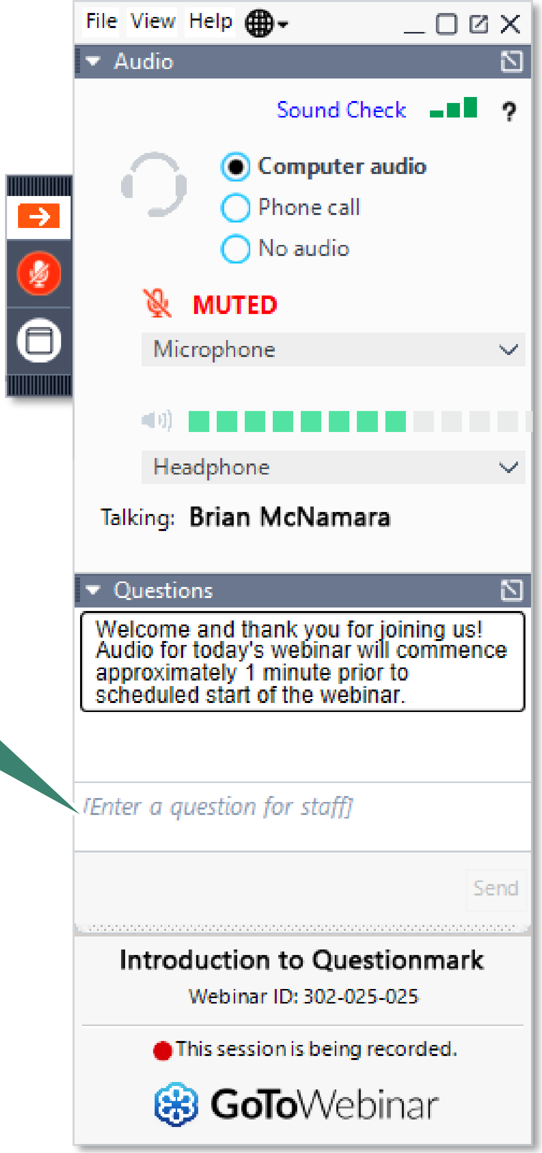
10 Quick Tips to Improve your Tests & Exams

Brian McNamara
Product Manager for Customer Engagement
Questionmark

To ask questions,
use the "Questions" feature



File View Help

Audio

Sound Check ?

● Computer audio

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Talking: Brian McNamara

Questions

Welcome and thank you for joining us! Audio for today's webinar will commence approximately 1 minute prior to scheduled start of the webinar.

[Enter a question for staff]

Send

Introduction to Questionmark

Webinar ID: 302-025-025

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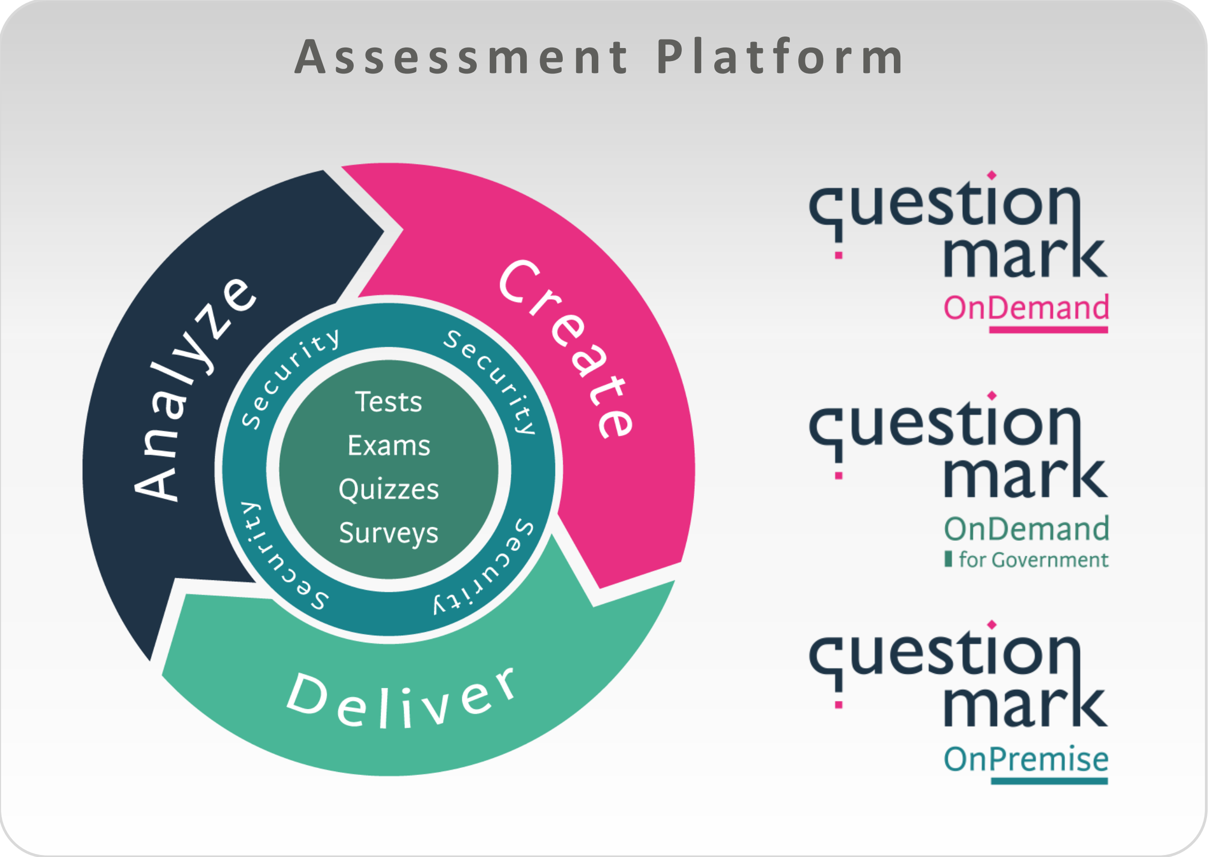
About Questionmark

- Measure knowledge, skills and abilities securely
  - Assessment platform
  - Proctoring solutions
  - Assessment content
- ISO/IEC 27001 Certified
- Founded in 1988
- Part of the Learnosity Group



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bsi. ISO/IEC 27001 Information Security Management

GSA Contract Holder
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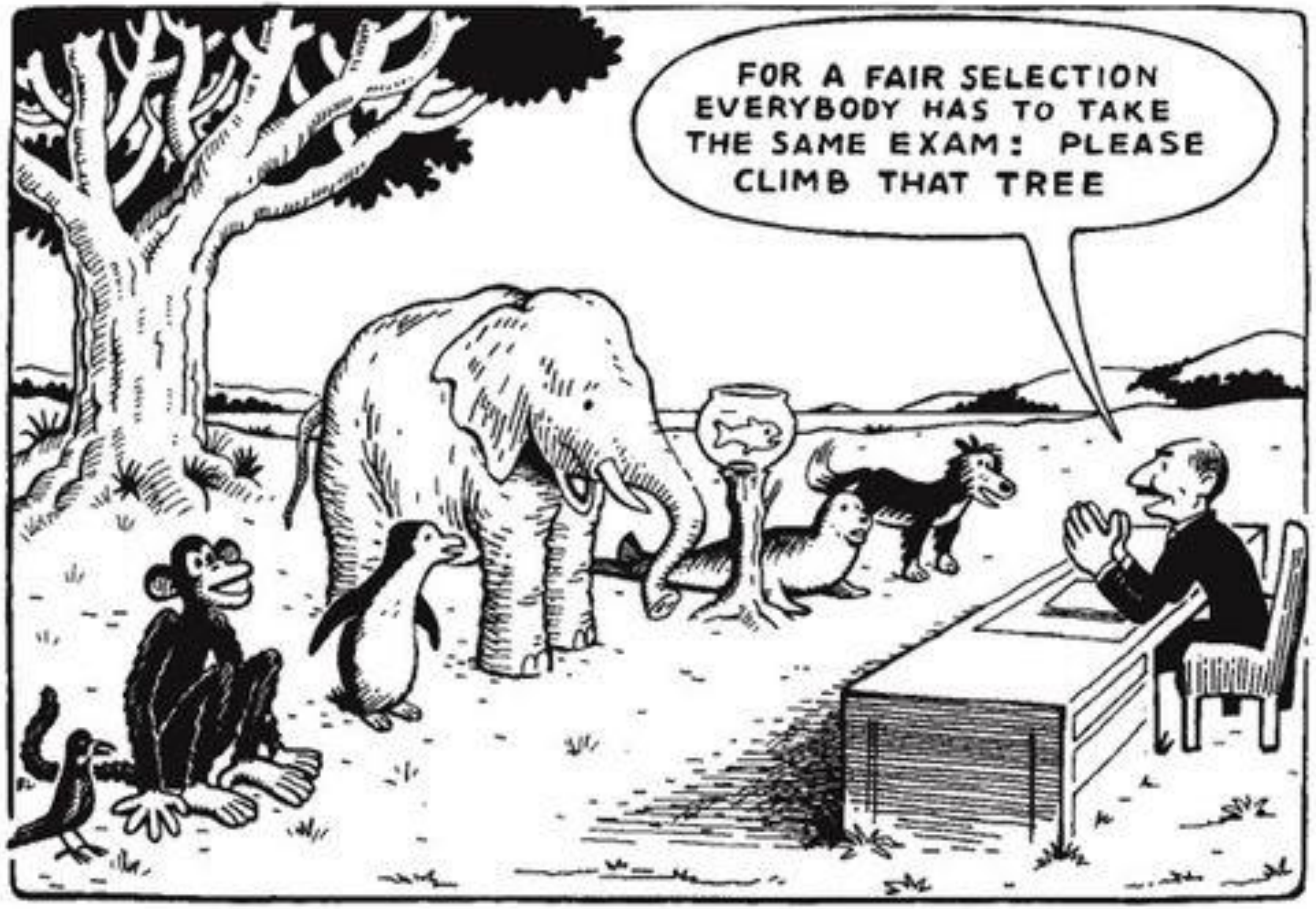
What is a ‘good’ test?



FOR A FAIR SELECTION EVERYBODY HAS TO TAKE THE SAME EXAM: PLEASE CLIMB THAT TREE

Is this a good test?

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Quick Poll ☑

Does the cartoon show a good test?

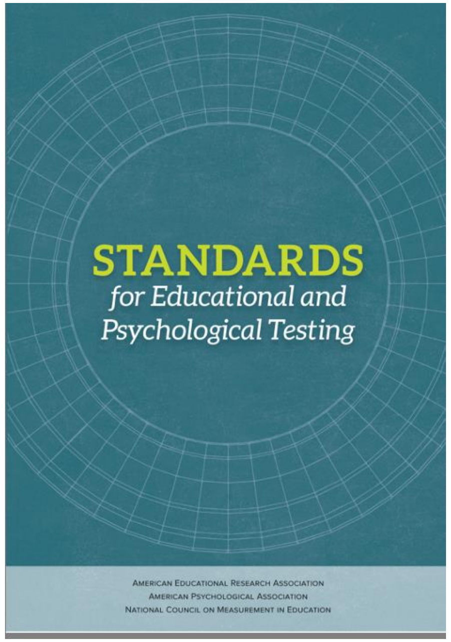
- No, it looks very unfair
- Yes, it looks a good test
- It depends what you are using the test for

This webinar: 10 questions we will answer

1. What makes a “good” test or exam?
2. How do I decide which areas to cover in a test?
3. How many questions should I include for each objective?
4. Is it safe and defensible to select questions at random?
5. Should my test/exam be open book or closed book?
6. What time limit should I set?
7. How can I work out a defensible cut score / pass mark?
8. What happens if some topics/questions are “must get right”?
9. What feedback should I give?
10. What are good resources to find out more?

Two good sources for a deeper dive

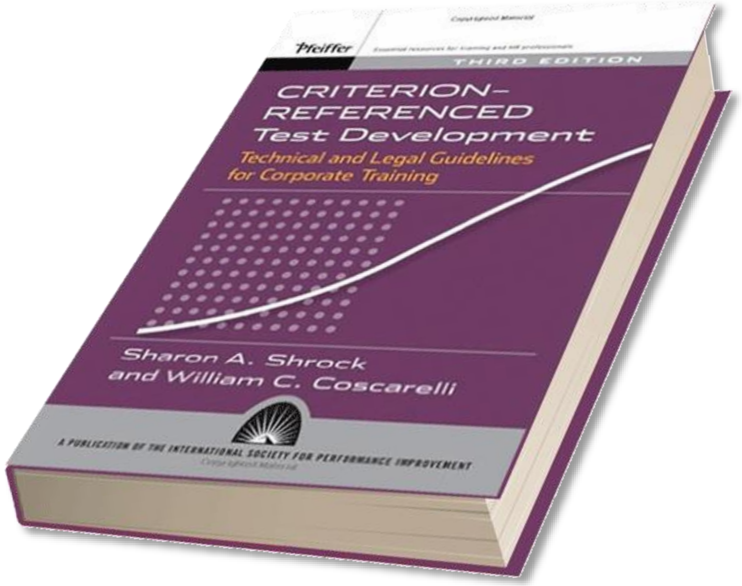
AERA/APA/NCME Standards
“The Standards”



STANDARDS
for Educational and
Psychological Testing

American Educational Research Association
American Psychological Association
National Council on Measurement in Education

Shrock and Coscarelli
Criterion Referenced Test Development



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THIRD EDITION

CRITERION-REFERENCED
Test Development
Technical and Legal Guidelines
for Corporate Training

Sharon A. Shrock
and William C. Coscarelli

A PUBLICATION OF THE INTERNATIONAL SOCIETY FOR PERFORMANCE IMPROVEMENT

1. What makes a “good” test or exam?

The Standards suggest three foundations for tests:

Validity

- Degree to which evidence and theory support the interpretation of test scores for proposed uses of tests

Reliability (or precision)

- Consistency of scores across instances of the testing procedure
- Reduced measurement error

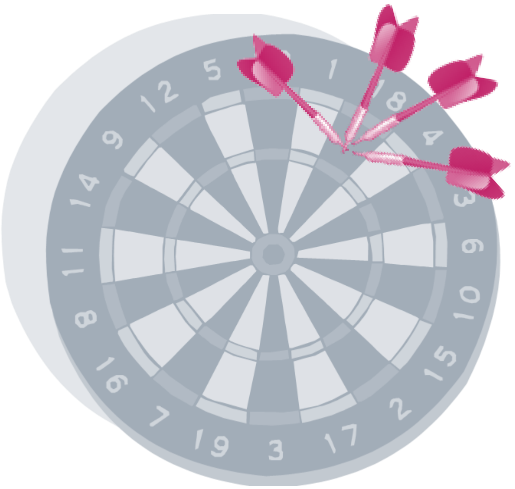
Fairness

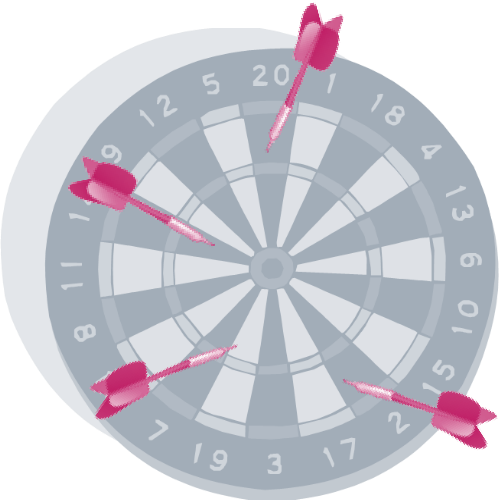
- Fair and equitable treatment of all individuals in the intended population of test-takers
- Does not advantage or disadvantage individuals because of characteristics irrelevant to the construct being measured

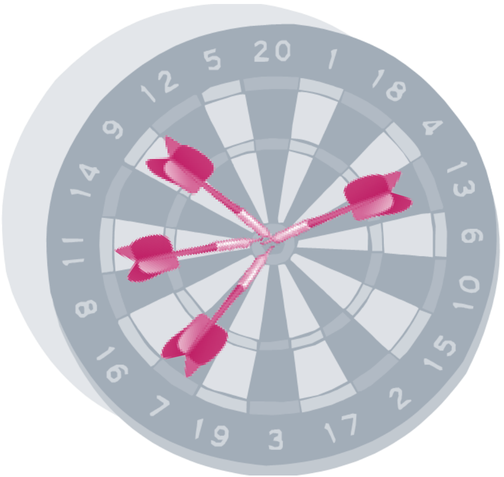
Validity and Reliability

Reliable:
- Dependable, repeatable, consistent

Valid:
- Measures appropriate knowledge and skills


Reliable but not Valid


Not Reliable, not Valid


Reliable and Valid

Three common approaches to Validity

Content validity

- Whether assessment content and composition is appropriate given what is being measured, e.g. does test cover knowledge/skills required to do a job

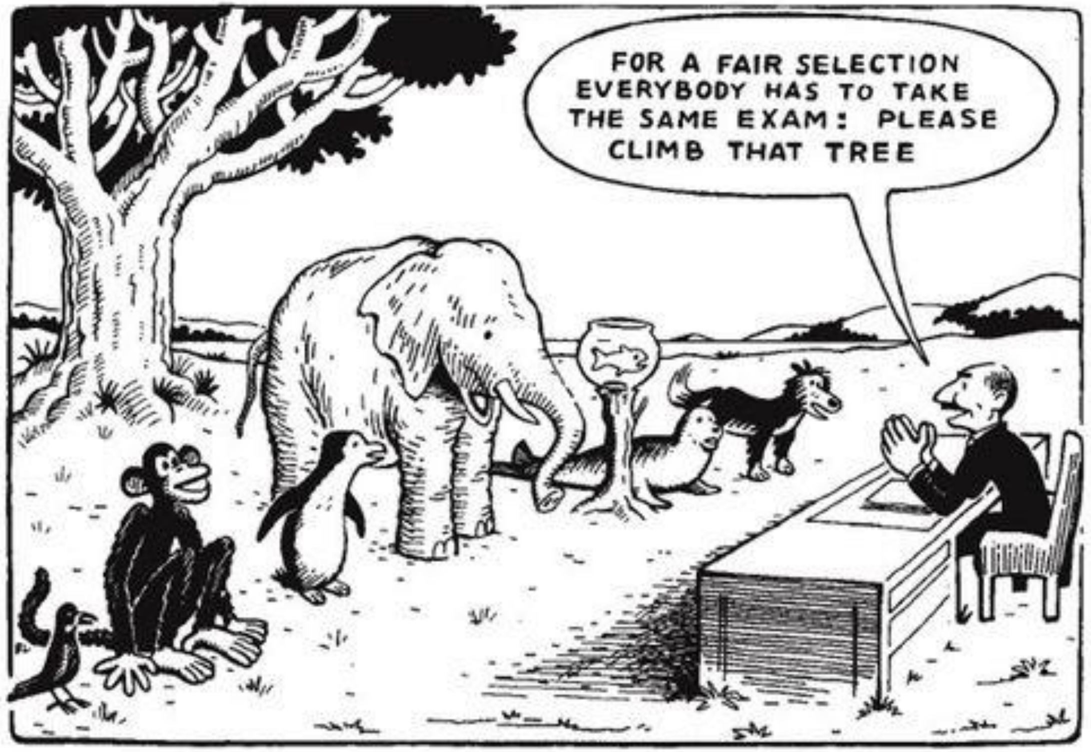
Criterion validity

- Whether test-taker assessment scores are related to other measures, e.g. do exam scores predict future performance?

Face validity

- Whether appears valid to test-takers and stakeholders

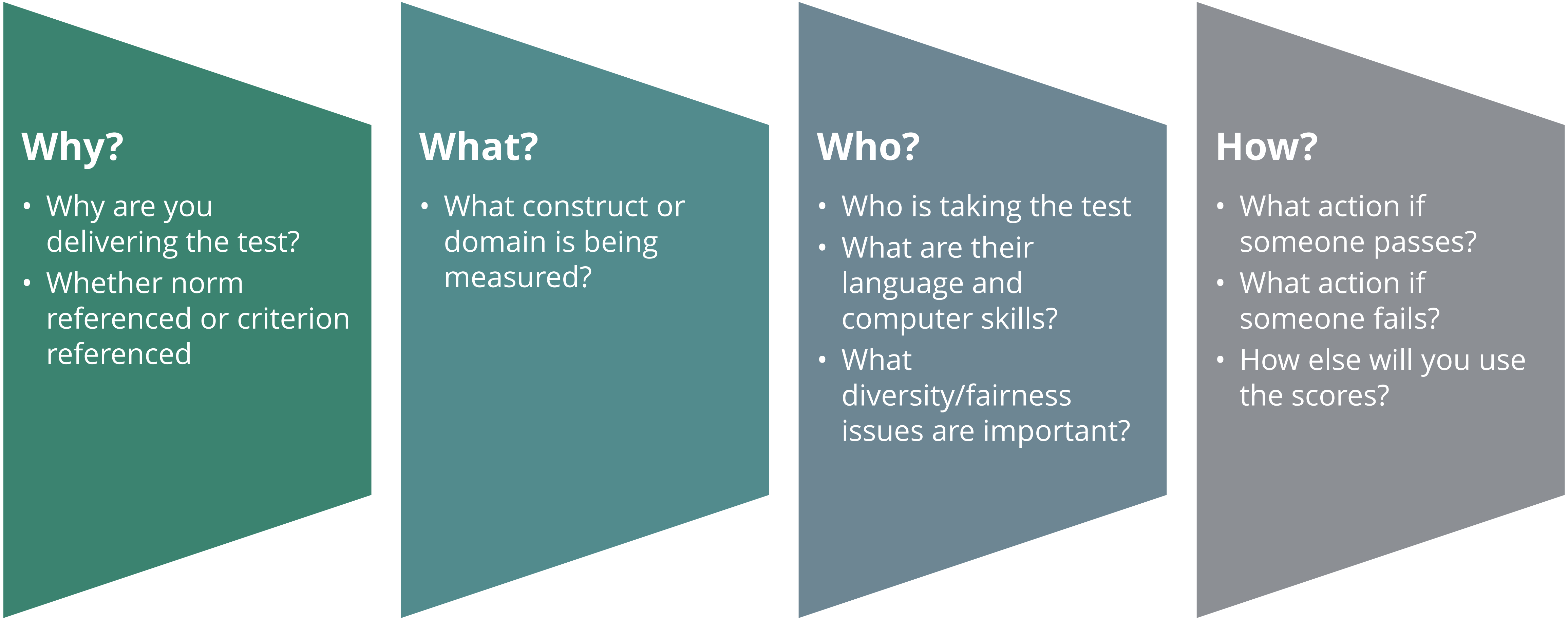
Is this a good test?


FOR A FAIR SELECTION EVERYBODY HAS TO TAKE THE SAME EXAM: PLEASE CLIMB THAT TREE

- Cartoon used to illustrate unfairness of standardized tests in education.
- However whether valid, reliable and fair depends on purpose
- For most purposes, it would be unfair. To recruit for a fruit-picking job in trees, might be useful part of selection process

2. How do I decide which areas to cover in a test?

Start with the purpose of your test



Why?

- Why are you delivering the test?
- Whether norm referenced or criterion referenced

What?

- What construct or domain is being measured?

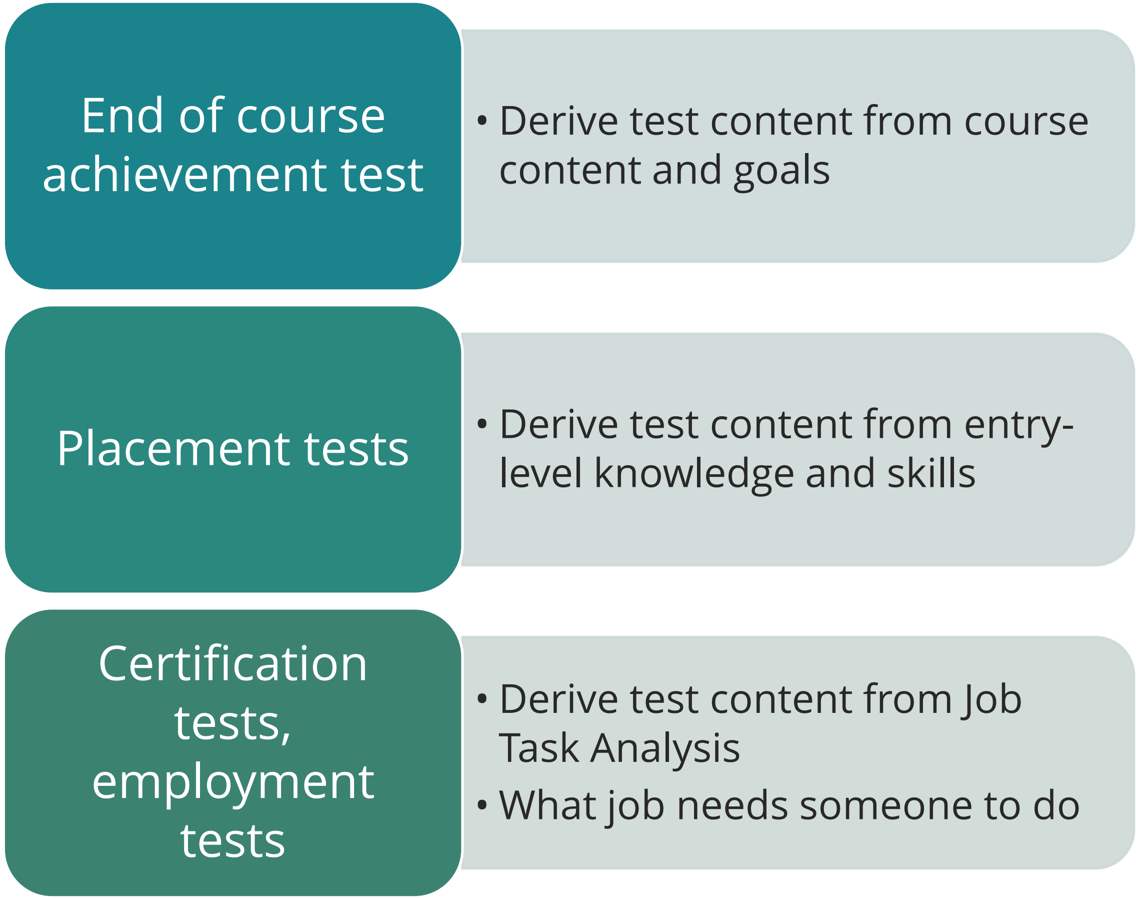
Who?

- Who is taking the test
- What are their language and computer skills?
- What diversity/fairness issues are important?

How?

- What action if someone passes?
- What action if someone fails?
- How else will you use the scores?

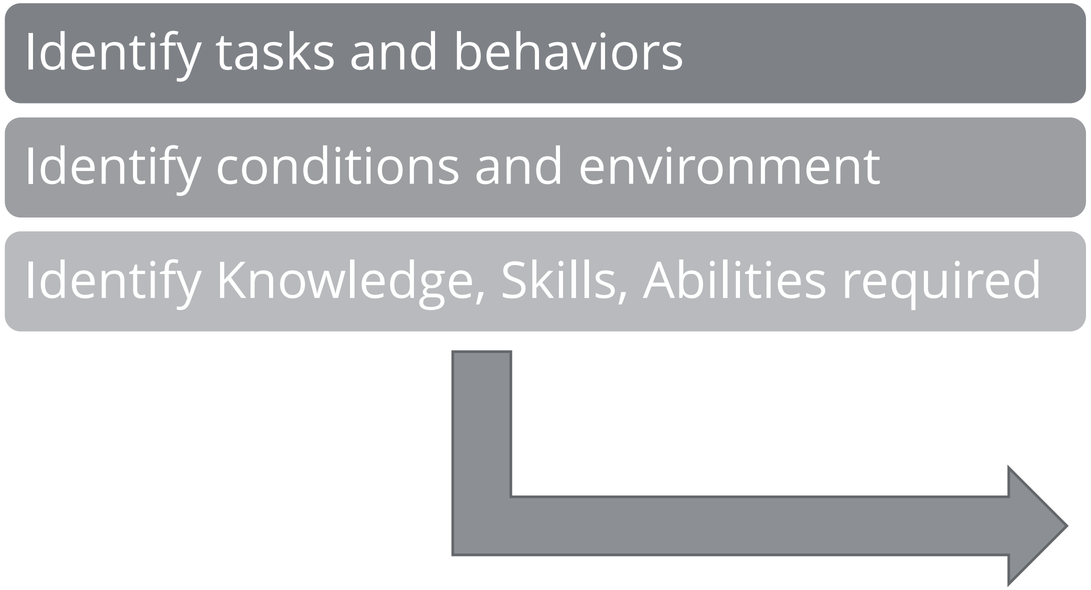
Determine content of the test based on the purpose



End of course achievement test	• Derive test content from course content and goals
Placement tests	• Derive test content from entry-level knowledge and skills
Certification tests, employment tests	• Derive test content from Job Task Analysis • What job needs someone to do

- Develop a test blueprint (AKA “test content outline”)
- Covers what is included and excluded
- Often a series of objectives and a weighting
- May include key knowledge or skills areas

Job Task Analysis



Identify tasks and behaviors

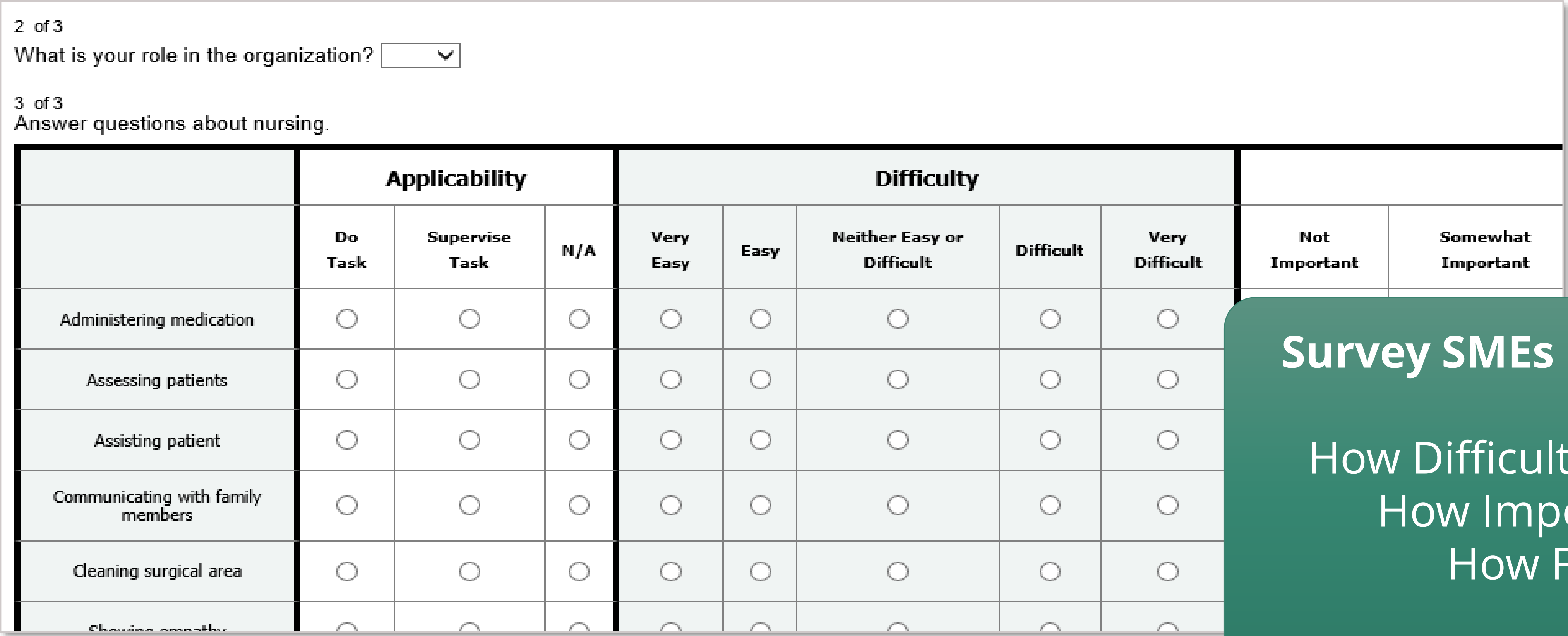
Identify conditions and environment

Identify Knowledge, Skills, Abilities required

Methods

- Panel of experts to describe the job
- Panel of stakeholders to define expectations
- Interview experts and stakeholders
  - What is done?
  - Why it is done?
  - Why it is important?
- **Survey experts and stakeholders to identify trends or patterns**
- Review related literature and documentation

Job Task Analysis (JTA) Surveys for content planning, validity



2 of 3

What is your role in the organization?

3 of 3

Answer questions about nursing.

	Applicability			Difficulty						
	Do Task	Supervise Task	N/A	Very Easy	Easy	Neither Easy or Difficult	Difficult	Very Difficult	Not Important	Somewhat Important
Administering medication	○	○	○	○	○	○	○	○		
Assessing patients	○	○	○	○	○	○	○	○		
Assisting patient	○	○	○	○	○	○	○	○		
Communicating with family members	○	○	○	○	○	○	○	○		
Cleaning surgical area	○	○	○	○	○	○	○	○		
Showing empathy	○	○	○	○	○	○	○	○		

Survey SMEs about key tasks

How Difficult?

How Important?

How Frequent?

How Critical?

- Job Task Analysis to determine and **validate** content of test
- Test Blueprint built from JTA, which drives test item development.

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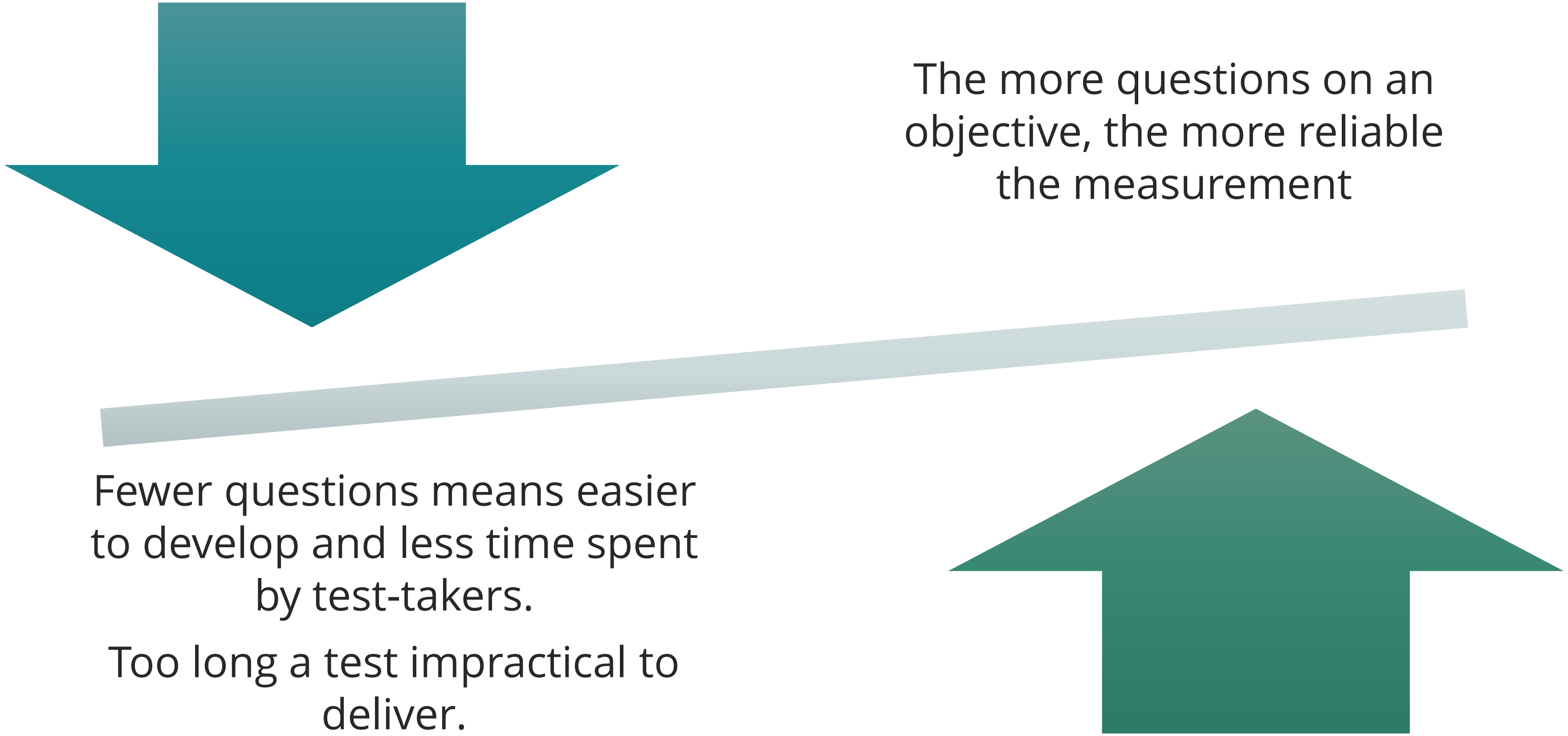
3. How many questions should I include for each objective?

A balance is needed



The more questions on an objective, the more reliable the measurement

Fewer questions means easier to develop and less time spent by test-takers.

Too long a test impractical to deliver.

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Advice on number of questions per objective:

Research evidence suggest 4-6 items generally per objective

- More adds increasingly less value
- Fewer risks not testing objective properly

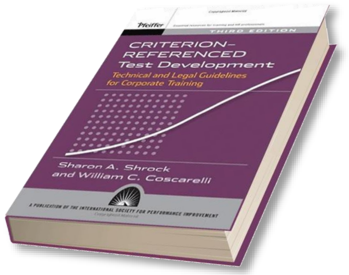
More questions needed for

- Critical objectives (e.g. health and safety)
- Large domain covered by objective (e.g. “Given access to manuals, diagnose the source of a radiation leak in a nuclear reactor”)

Less questions needed for

- Smaller domain (something very specific e.g. “List the 6 steps required to make a milkshake on a specific machine”)
- If objectives related and so doing well in one likely will mean doing well in the other

Guidance from Shrock & Coscarelli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Test Development
Technical and Legal Guidelines for Corporate Training
Sharon A. Shrock
and William C. Coscarelli

Criticality?	Domain size?	Related?	# questions
Critical	From a large domain	Unrelated	10-20
		Related	10
	From a small domain	Unrelated	5-10
		Related	5
Not critical	From a large domain	Unrelated	6
		Related	4
	From a small domain	Unrelated	2
		Related	1

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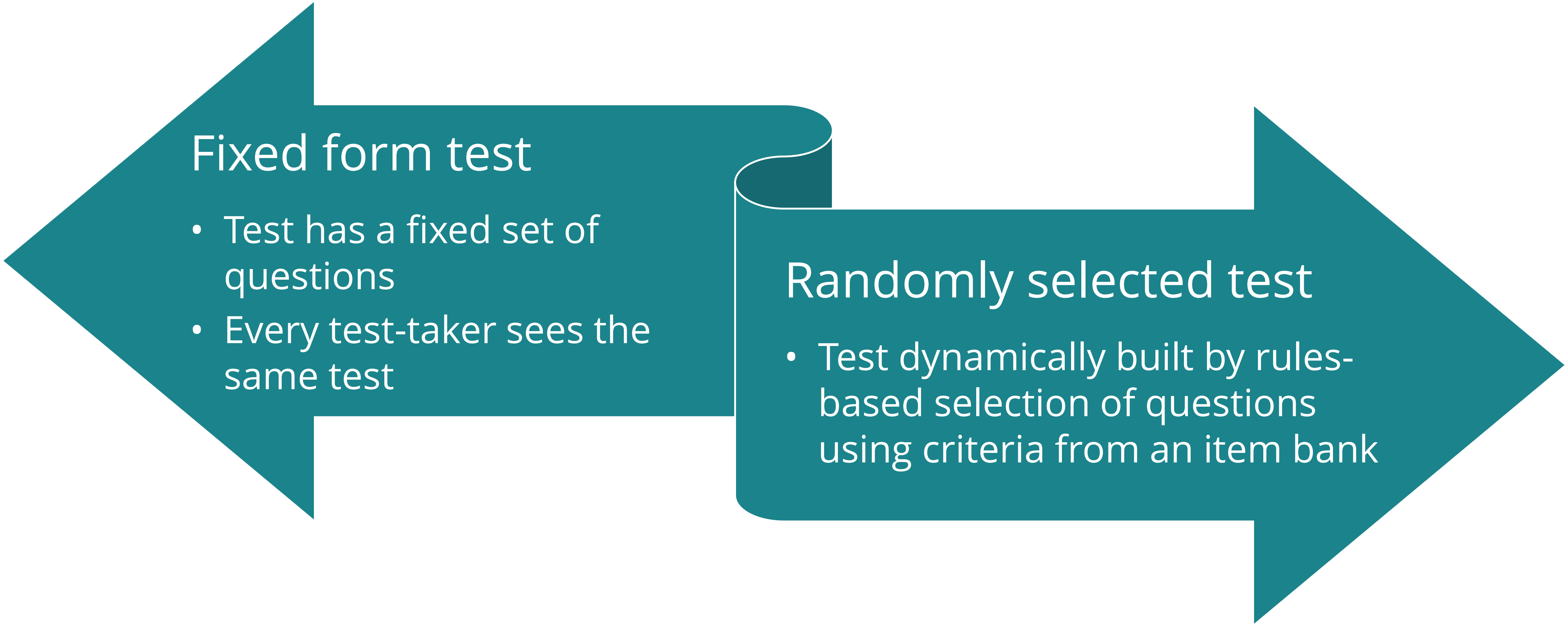
4. Is it safe and defensible to select questions at random?

Random vs fixed form



Fixed form test

- Test has a fixed set of questions
- Every test-taker sees the same test

Randomly selected test

- Test dynamically built by rules-based selection of questions using criteria from an item bank

Which is best?

Advantages of fixed form

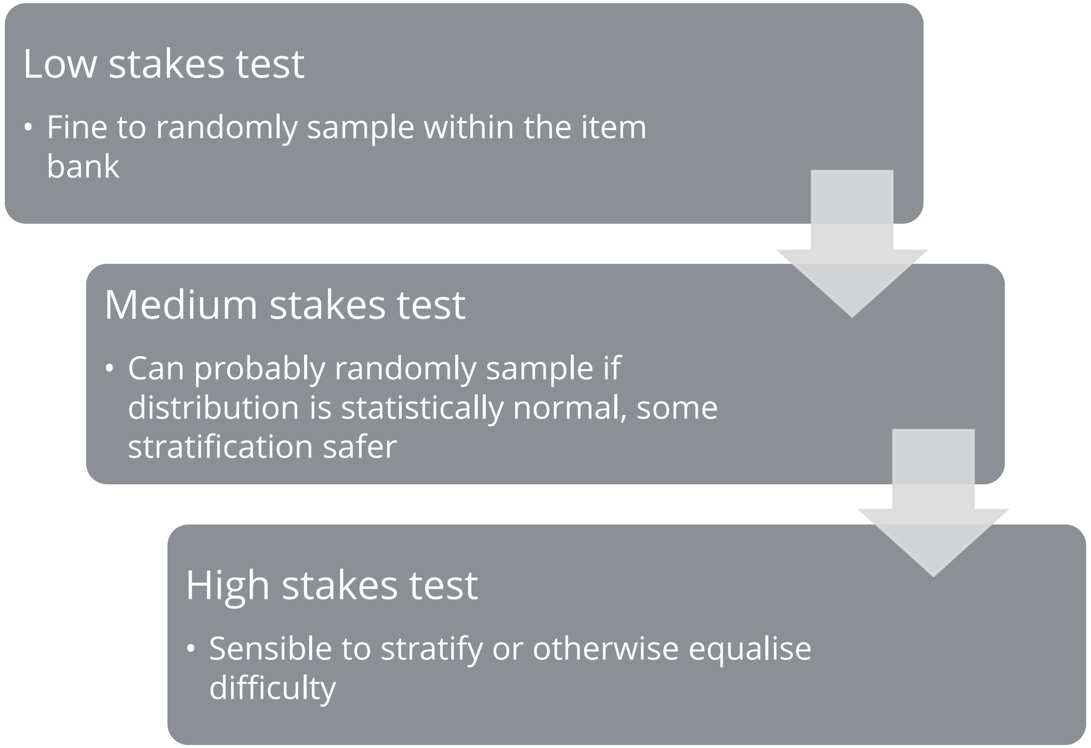
- Each test-taker gets same test which is fairer (no risk of someone getting easier or harder test)
- Need to write less questions
- Ensure no questions give the answer to others
- Gets more complicated if multiple forms needed

Advantages of random selection

- Reduces risk of cheating
- Reduces item exposure
- Easily retire or add individual questions without impacting test
- Easier to deliver test on demand (all the time not just one fixed timeslot)

How can you deal with varying difficulties?

Shrock and Coscarelli



Low stakes test

- Fine to randomly sample within the item bank

Medium stakes test

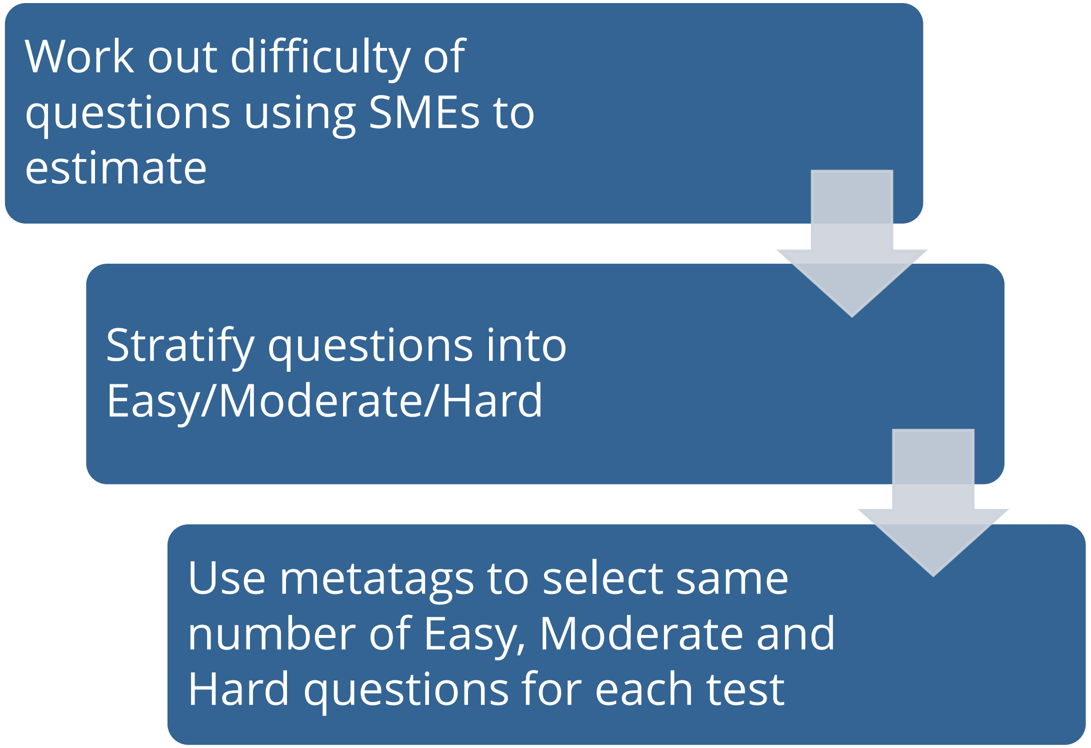
- Can probably randomly sample if distribution is statistically normal, some stratification safer

High stakes test

- Sensible to stratify or otherwise equalise difficulty

The problem of saltatory cut-score: some issues and recommendations for applying the Angoff to test Item Banks

Case study: US Coast Guard approach



Work out difficulty of questions using SMEs to estimate

Stratify questions into Easy/Moderate/Hard

Use metatags to select same number of Easy, Moderate and Hard questions for each test

Randomly designed tests – how can they be fair to all

5. Should my test/exam be open book or closed book?

What is the difference?

Open book test

- Allows test-takers to have reference books, notes or tools available whilst taking the test

Closed book test

- Requires test-takers to answer all questions from their own knowledge without access to reference resources

Arguments for open book tests

Closer to performance environment

- In real work settings, we can look things up. Why not also in exams?

Reduces test anxiety

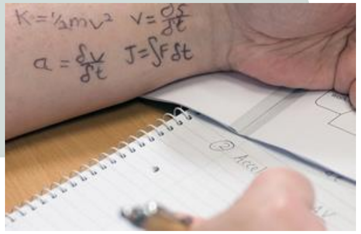
- Evidence suggests open book exams less stressful than closed book exams

Encourages testing higher level thinking skills

- More relevant for most work skills

Reduces cheating

- No longer illegal to bring in notes

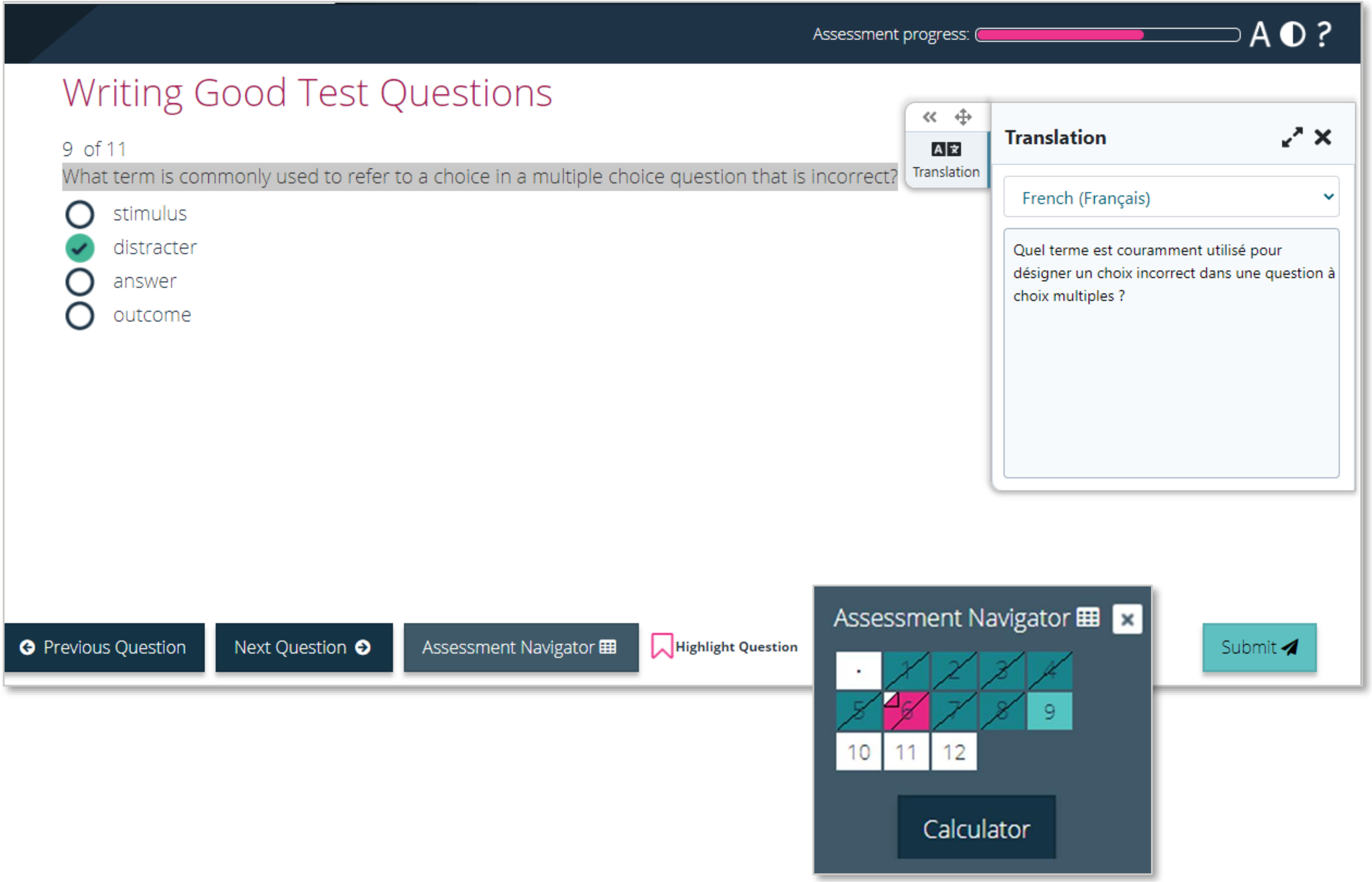


Arguments in favor of closed book tests

More conventional	• May also give more face validity because people are used to them
Important to know key knowledge in most job roles	• If a fire starts, you don’t want to have to Google something to remember what to do
Closed book tests easier to create	• Open book tests need a little more imagination in item writers
Fairness considerations…	• Could some test-takers not afford expensive text books? • Might some people bring in someone else’s notes? • Risk of answers being available on the web

In-exam tools and resources

- Provide a standard set of resources to all test-takers – for example:
  - Reference materials
  - Calculator or other tools
  - Machine Translation (new option!)



Writing Good Test Questions

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What term is commonly used to refer to a choice in a multiple choice question that is incorrect?

○ stimulus
● distracter
○ answer
○ outcome

Translation

French (Français)

Quel terme est couramment utilisé pour désigner un choix incorrect dans une question à choix multiples ?

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Quick Poll ☑

Within your organization, do you use open or closed book tests?

- All closed book
- Mostly closed book
- Some of each
- Mostly open book
- All open book

6. What time limit should I set?

What is the purpose of the test/exam?

Power tests

- Measures knowledge / skill of test-taker
- Most common type of test
- Most people should have enough time to answer all questions

Speed tests

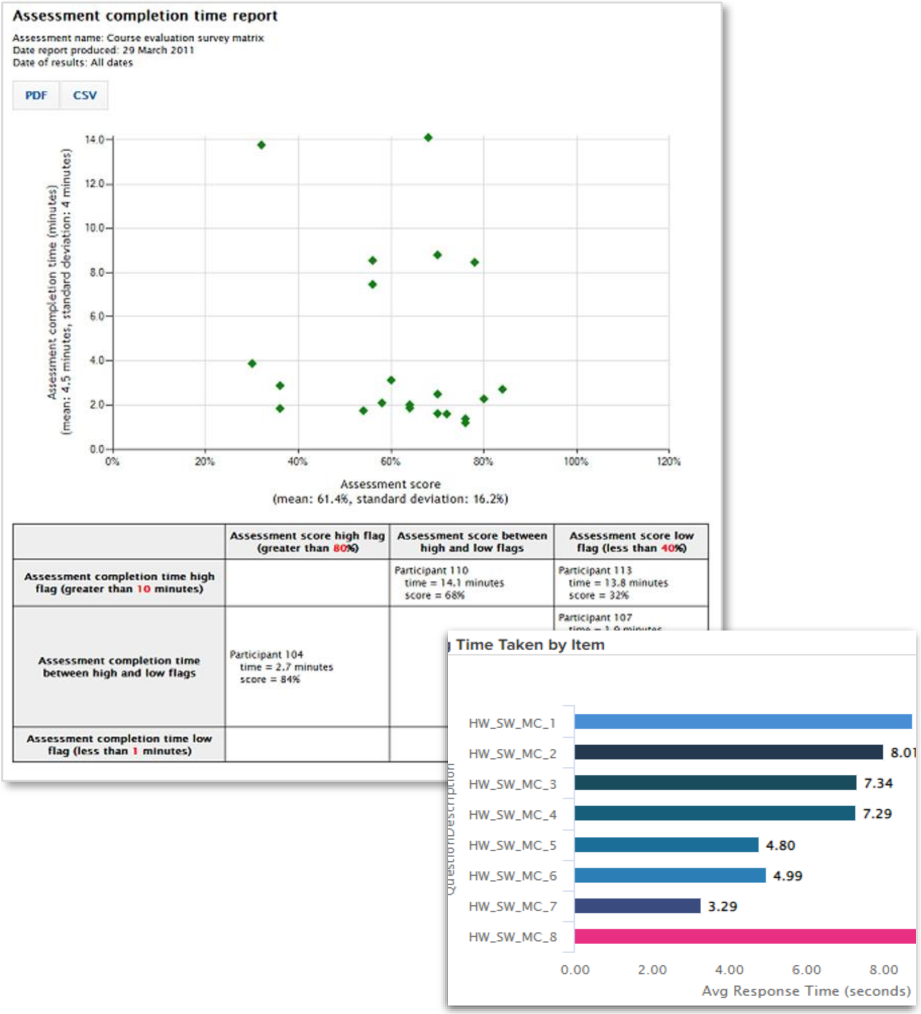
- Measure speed of test-taker in making responses
- Useful when fast speed an important part of job requirements
- In speed tests, many people may not finish all items

Allocating sufficient time for the test

- Ensure that the time limit doesn't start until
  - Instructions given
  - Any practice items taken
  - Any demographic information provided

  (In Questionmark, use untimed block)

- Seeing how long people take in pilot best way to work out required time
- Monitor actual time taken by test-takers to check remains reasonable



Assessment completion time report

Assessment name: Course evaluation survey matrix
Date report produced: 29 March 2011
Date of results: All dates

PDF
CSV
Assessment completion time (minutes)
(mean: 4.5 minutes, standard deviation: 4 minutes)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0%
20%
40%
60%
80%
100%
120%
Assessment score
(mean: 61.4%, standard deviation: 16.2%)

	Assessment score high flag (greater than 80%)	Assessment score between high and low flags	Assessment score low flag (less than 40%)

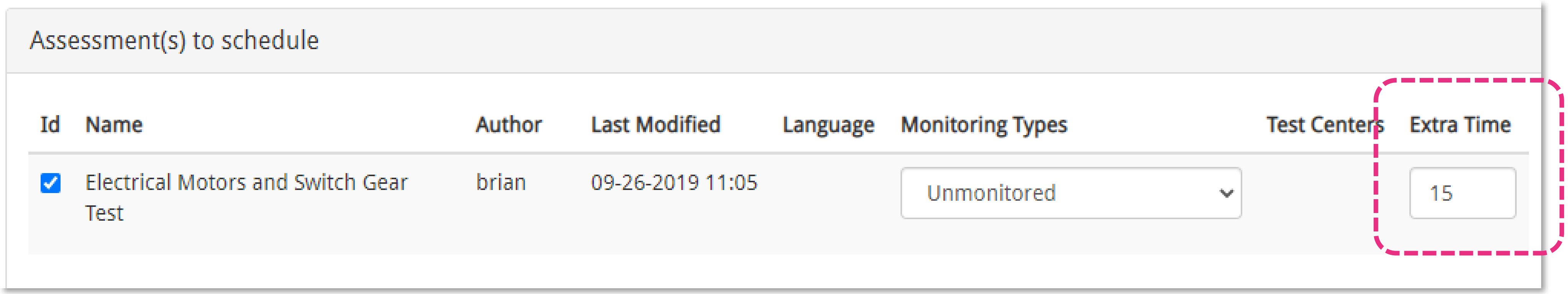
Assessment completion time high flag (greater than 10 minutes)		Participant 110
		time = 14.1 minutes
		score = 68%
			Participant 113
			time = 13.8 minutes
			score = 32%

Assessment completion time between high and low flags	Participant 104
	time = 2.7 minutes
	score = 84%
			Participant 107
			time = 1.9 minutes

Assessment completion time low flag (less than 1 minutes)			

Extra time

- Give extra time
  - Common to give extra time as accommodation for some special needs
  - Extra time also given for linguistic reasons (taking assessment in second language)
  - Ideally base the extra time on piloting (not just a fixed extra %)
- Make sure test delivery system allows you to accommodate participants as needed
  - Allocate additional time for certain individuals or groups in a “schedule” or an “exception schedule”



Assessment(s) to schedule

Id	Name	Author	Last Modified	Language	Monitoring Types	Test Centers	Extra Time
☑	Electrical Motors and Switch Gear Test	brian	09-26-2019 11:05		Unmonitored		15

7. How can I work out a defensible cut score / pass mark?

(for a criterion referenced test or exam)

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Quick Poll ☑

What is a good cut score / pass mark for a criterion referenced test?

- 70%
- 80%
- 90%
- It depends how hard the questions are

Start with consequences of mis-classification

	Fail	Pass
Competent	Error of rejection	Correct decision: test taker should pass
Not competent	Correct decision: test taker should not pass	Error of acceptance

If consequences of error of acceptance high (e.g. surgeon, pilot), set cut score high to minimize

If error of acceptance less of a concern or consequences of error of rejection high (e.g. test taker lawsuit), may consider lower cut score.

Setting Defensible Cut Scores

- Risky practice:
  - Guess
  - Roll dice
  - Pick a number out of a hat

- Good Practice:
  - Set pass/cut score to reflect minimally acceptable competence
  - Passing test demonstrates competence

One route is the Angoff Method

- Based on this question:
  - What is % chance a marginal test-taker will get question right?
- How it works
  - Poll SMEs
  - Consider marginal test-takers and probability of getting specific questions right (0-100%)
  - Average out the chances to work out the cut score

More info : Webinar by Questionmark customer on the Angoff method

Why use this method?

One of our customers summed it up this way:

The Angoff Method is:

- *Defensible*
- *Easy to use and implement*
- *Widely accepted*

Angoff Method Example

What is the % chance that a borderline test-taker will get question right?

	SME A	SME B	SME C	Total
Q1	75%	75%	75%	75.00%
Q2	70%	80%	80%	76.67%
Q3	65%	75%	70%	70.00%
Q4	60%	85%	90%	78.33%
Q5	80%	80%	85%	81.67%
Q6	80%	80%	80%	80.00%
Q7	75%	80%	75%	76.67%
Q8	65%	90%	65%	73.33%
Q.....	75%	80%	75%	76.67%
Q50	65%	85%	65%	71.67%
Totals	**71%**	**81%**	**76%**	**76%**

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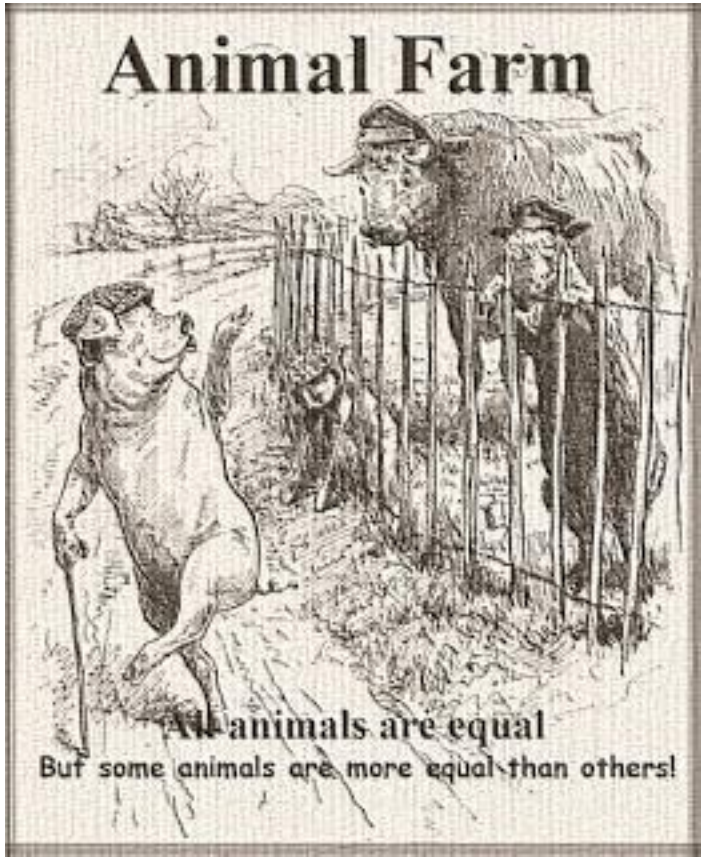
8. What happens if some topics/questions are “must get right”?

Are all your items and topics "equal"?



- Is a poor score in one item or topic made up by a good score on other items/topics?
- Or is it important that test-takers get some questions right or score well in some topics?

Golden questions or topics can be important

Are all items substitutable?

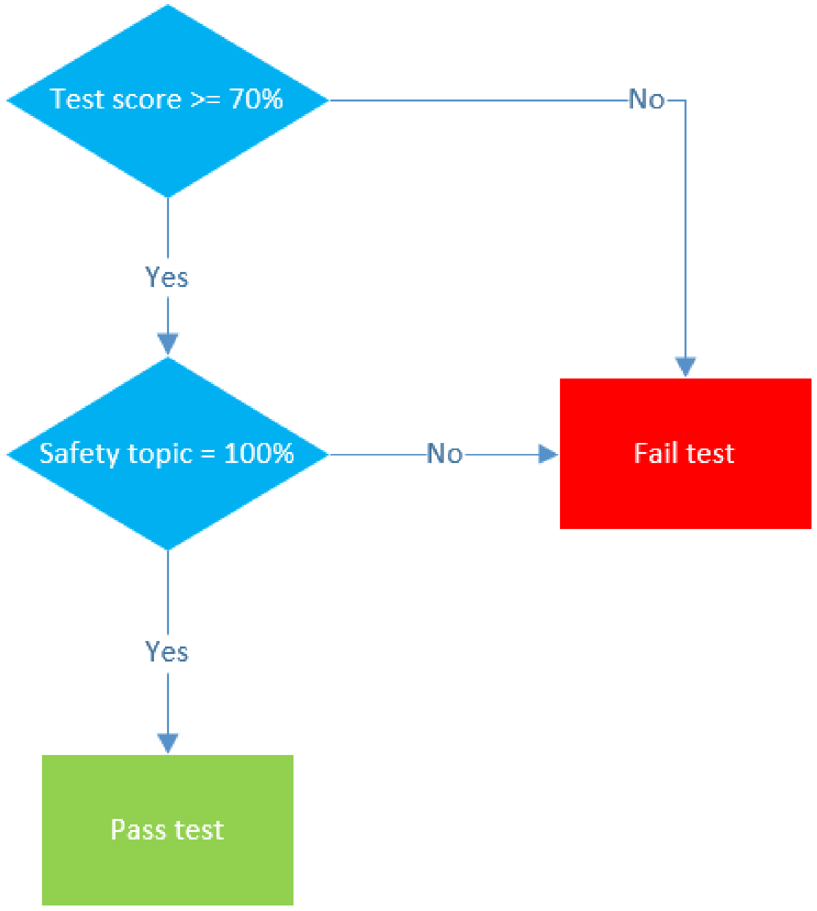
- Is a poor score in one item or topic made up by a good score on other items/topics?
- If so, you can set a single “cut score”

Some items needed for mastery?

- Sometimes, critical items or topics must be passed to show competence
  - Sometimes called “golden questions” or “golden topics”
  - Failing a safety question might mean failing the test even if all other questions are right

How do you deal with this?

- You want test-taker to pass
  - If reach the cut score
  - And meet the safety / other criteria
- In Questionmark, we have concept of a prerequisite topic, where you must pass that topic as well as meet the cut score for the test



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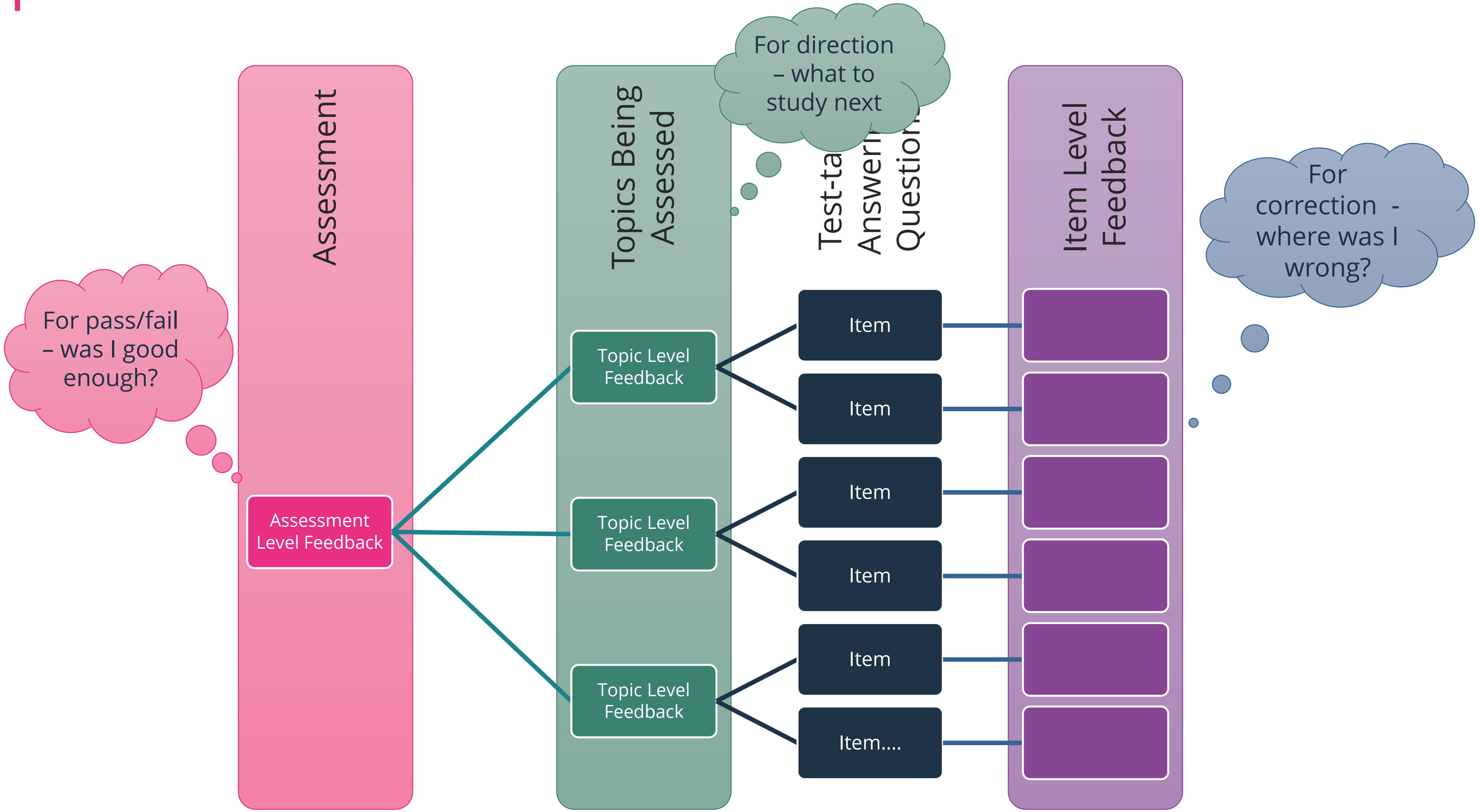
9. What feedback should I give?

Types of Assessment Feedback



For pass/fail – was I good enough?

Assessment

Assessment Level Feedback

Topics Being Assessed

Topic Level Feedback

Topic Level Feedback

Topic Level Feedback

For direction – what to study next

Test-ta
Answeri
Question

Item

Item

Item

Item

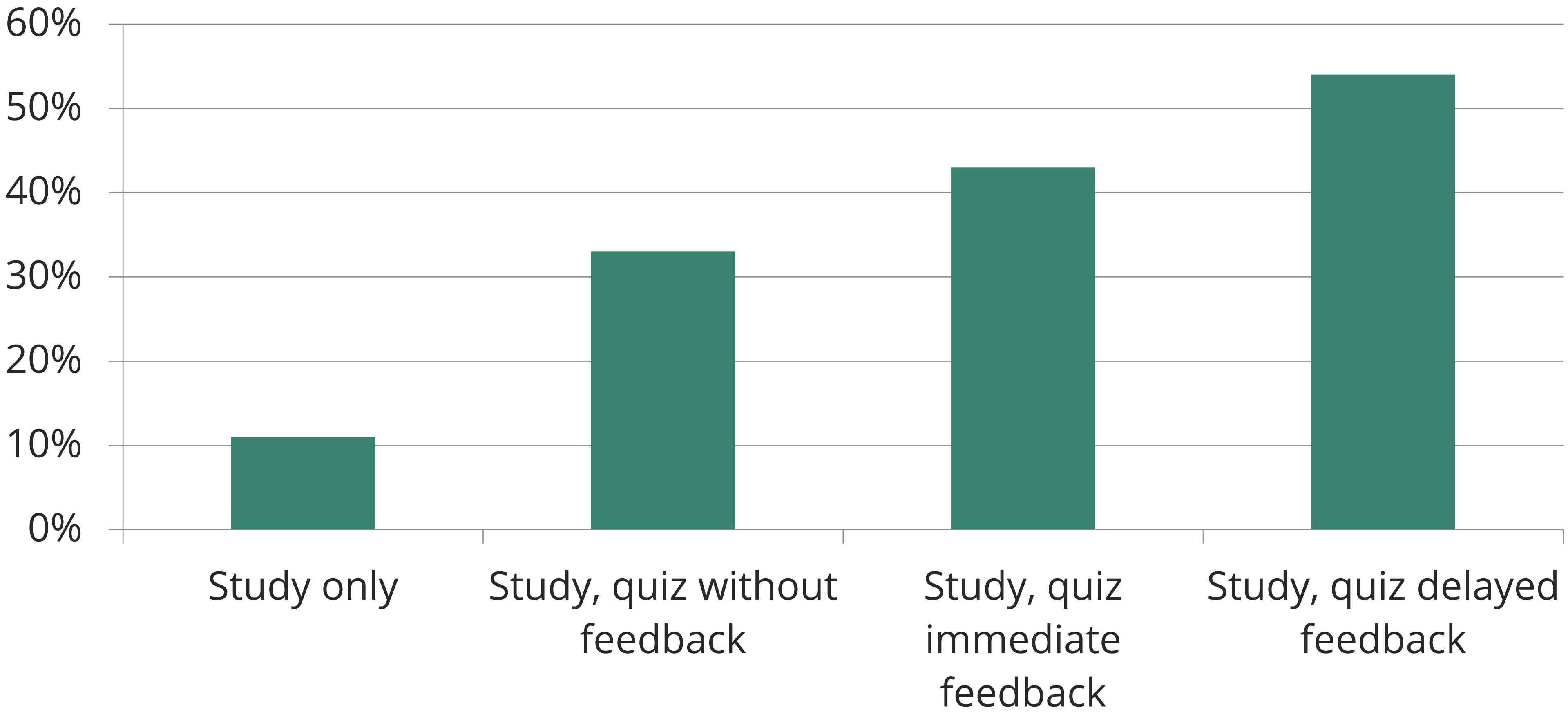
Item

Item….

Item Level Feedback

For correction - where was I wrong?

In some cases, feedback can improve understanding & retention of learning



Data showing retention after one week from Roediger & Butler : The critical role of retrieval practice in long-term retention. Trends in Cognitive Sciences 2010.

Feedback advice

Helpful in all learning contexts

- May not be appropriate in certification and some other contexts
- Most valuable to correct misconceptions

Feedback at the topic level

- Can be very helpful to direct for further study
- Most useful if topic has enough questions to be reliable (risk of small numbers of questions in a topic meaning failing or passing a topic less meaningful)

Feedback at the question level

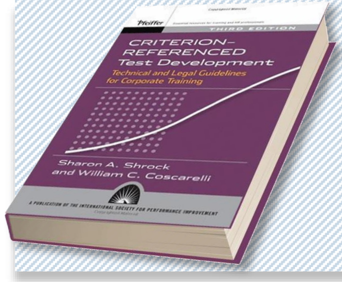
- Usually best only to give if question was wrong
- Give the correct answer
- Keep feedback short, clear and simple
- Too long feedback risks attention loss

More advice:

- Will Thalheimer, Providing Learners with Feedback
- ETS Research report on "Focus on formative feedback"

10. What are good resources to find out more?

As we already mentioned


CRITERION-REFERENCED Test Development
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Criterion-Referenced Test Development:
Technical and Legal Guidelines for Corporate Training

Sharon Shrock and William Coscarelli

Standards for Educational and Psychological Testing

AERA, APA and NCME

Some useful standards

- ISO standard
  - ISO 10667: Assessment service delivery -- Procedures and methods to assess people in work and organizational settings
- Institute for Credentialing Excellence (ICE)
  - Assessment-based certificate standard
  - NCCA standards for certification programs
- International Test Commission standards
  - The ITC Guidelines on Adapting (translating) tests
  - The ITC Guidelines on the Security of Tests, Examinations and Other Assessments
  - (and others)

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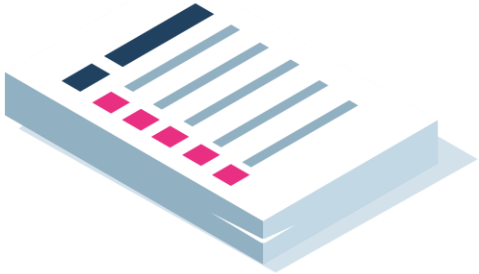
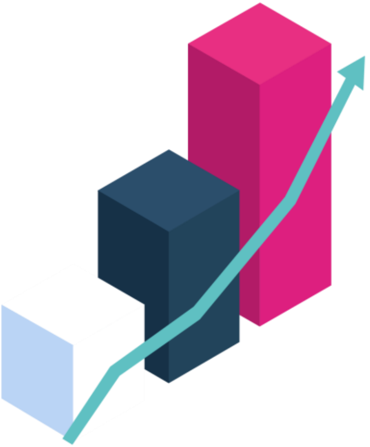
Your questions

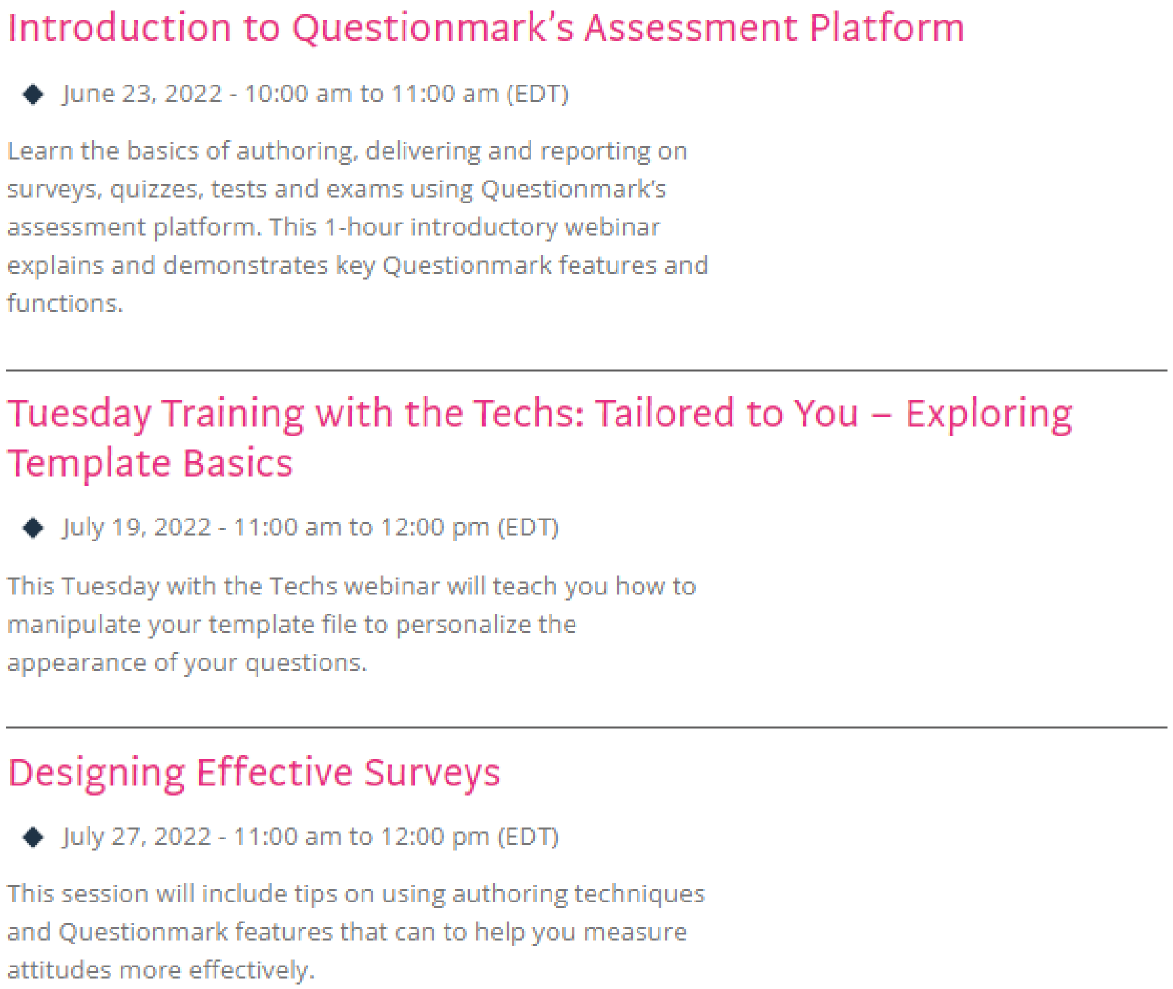
White papers, infographics, reports, eBooks and more!





www.questionmark.com/resources

Upcoming Webinars



Introduction to Questionmark's Assessment Platform

- June 23, 2022 - 10:00 am to 11:00 am (EDT)

Learn the basics of authoring, delivering and reporting on surveys, quizzes, tests and exams using Questionmark's assessment platform. This 1-hour introductory webinar explains and demonstrates key Questionmark features and functions.

Tuesday Training with the Techs: Tailored to You – Exploring Template Basics

- July 19, 2022 - 11:00 am to 12:00 pm (EDT)

This Tuesday with the Techs webinar will teach you how to manipulate your template file to personalize the appearance of your questions.

Designing Effective Surveys

- July 27, 2022 - 11:00 am to 12:00 pm (EDT)

This session will include tips on using authoring techniques and Questionmark features that can to help you measure attitudes more effectively.

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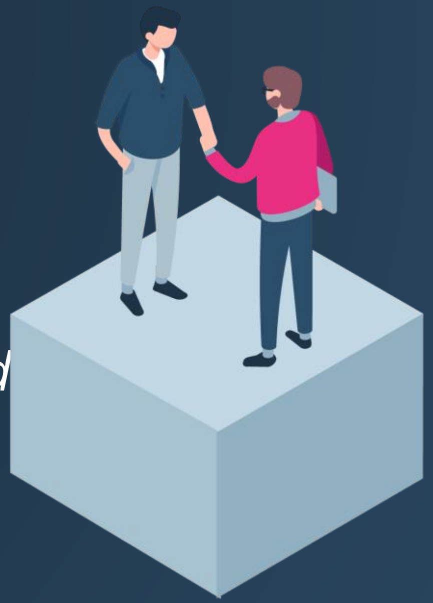
How to Evaluate

Request a one-on-one demo

The Questionmark team will contact you to arrange a demonstration tailored and questions

www.questionmark.com/request-demo



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Thank you for attending!

We hope to see you at a future webinar.

Keep up-to-date at www.questionmark.com/resources/blog