



The University of  
**Nottingham**

UNITED KINGDOM · CHINA · MALAYSIA

# Making e-Assessment Work

## A LEAN MANAGEMENT APPROACH

**Dr Simon Wilkinson**  
*Rogō System Manager*

# Presentation

History

Performance Management

Lean Management

Open Source

Exam Lifecycle

# History

- 1999** 100 formative True/False question
- 2005** first Summative Exam
- 2009** first video used
- 2010** first audio used
- 2011** Rogō becomes open source
- 2012** 21,000 exam papers delivered online

# Performance Management

THE 4Ps OF PERFORMANCE

# Purpose

Are students fit for purpose?

Are assessments fit for purpose?

Is the IT fit for purpose?



# People

Academics

Administrators

External Examiners

Students



# Process

Writing

Reviewing

Answering

Reporting

Feedback



# Performance!



# Lean Management

REMOVING WASTE

# What is Lean?

“

The core idea is to maximize  
customer value while  
minimizing waste.

”

# People

Academics

Administrators

External Examiners

Students



# What is Lean?

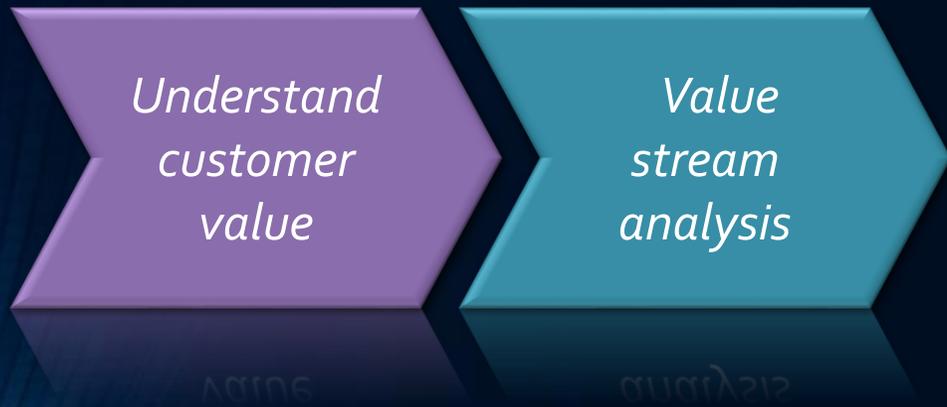


*Understand  
customer  
value*

## **Example**

Identify questions which need to be modified

# What is Lean?



## Example



# What is Lean?



## Example



# What is Lean?



## Example

Report compiled when needed

# What is Lean?



## Example

Shortcut added to edit questions

# Open Source

DEVELOPMENT MODEL

# Open Source Software

Free license

Source code is included

Anyone can modify the code

Modified versions can be redistributed



```
public function compile_report($recache) {
    $results_cache = new ResultsCache($this);
    if ($recache or $results_cache->should_recache()) {
        $this->recache = true;
    } else {
        $this->recache = false;
    }

    $moduleID = Paper_utils::get_modules($this);
    $this->moduleID_in = implode(',', array($moduleID));

    $this->exclusions->load();

    $this->load_answers();

    $this->set_log_late();

    $this->load_absent();

    $this->find_users();

    $this->load_metadata();

    $this->load_overrides();

    $this->load_results();

    $this->adjust_marks();

    $this->add_rank();

    $this->convert_moduleIDs();

    $this->flag_subpart();
}
```

# Successful OSS Systems

Linux

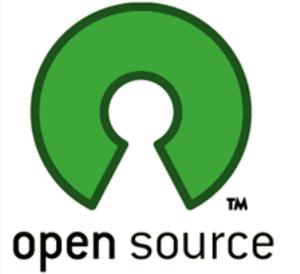
Android

Firefox

Apache

MySQL

Moodle



# Rogō

“

To create, as a community, a leading e-assessment management system that is scalable, secure, useable and extensible.

”

[rogo-oss.nottingham.ac.uk](http://rogo-oss.nottingham.ac.uk)



# Exam Lifecycle

MANAGEMENT IN PRACTICE

# Exam Lifecycle

## Pre-Exam

- Question writing
- Blueprinting
- Internal peer review
- External Examiner review
- Standards Setting

# Exam Lifecycle

## Pre-Exam

- Question writing
- Blueprinting
- Internal peer review
- External Examiner review
- Standards Setting

## Mid-Exam

- Questions presented
- Answers recorded
- Crash Recovery

# Exam Lifecycle

## Pre-Exam

- Question writing
- Blueprinting
- Internal peer review
- External Examiner review
- Standards Setting

## Mid-Exam

- Questions presented
- Answers recorded
- Crash Recovery

## Post-Exam

- Analysis of performance
- Fix incorrect answers
- Exclude poor questions
- Export marks
- Student feedback

# Exam Lifecycle

## Pre-Exam

- Question writing
- Blueprinting
- Internal peer review
- External Examiner review
- Standards Setting

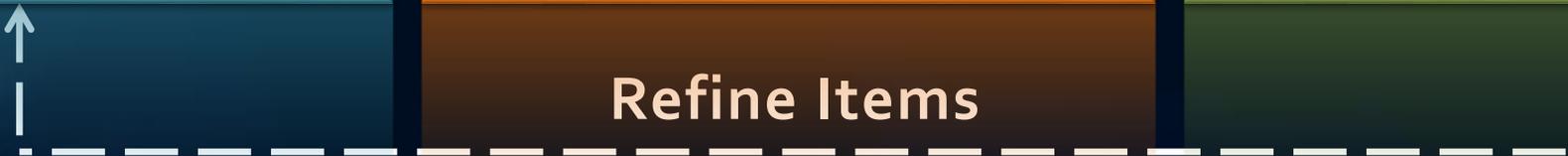
## Mid-Exam

- Questions presented
- Answers recorded
- Crash Recovery

## Post-Exam

- Analysis of performance
- Fix incorrect questions
- Exclude poor questions
- Export marks
- Student feedback

Refine Items



# Problem Authentication

Pre-Exam

Mid-Exam

Post-Exam

What happens when student forgets password?

# Solution 1

## Authentication

Pre-Exam

Mid-Exam

Post-Exam

### Password lists

Mr Bilbo Baggins	h0bb1t
Mr Bugs Bunny	wH1te46
Mr Daffy Duck	green26
Miss Piggy	p1ggy2

# Solution 2

## Authentication

Pre-Exam

Mid-Exam

Post-Exam

Paper guest accounts

User	Password	Name
------	----------	------

user1	passwd1	_____
-------	---------	-------

user2	passwd2	_____
-------	---------	-------

user3	passwd3	_____
-------	---------	-------

# Solution 3

## Authentication

Online guest accounts

Pre-Exam

Mid-Exam

Post-Exam



### Guest Account Registration

Title  Mr  Miss  Mrs  Ms  Dr

First Name

Surname

Student ID

# Problem Exam Scheduling

Pre-Exam

Mid-Exam

Post-Exam

How to handle exam scheduling?

# Solution Exam Scheduling

Pre-Exam

Mid-Exam

Post-Exam

Summative Exam Details

Academic Session  Barriers Needed  Duration  mins

Date required  Cohort Size  Sitings

Campus

Notes  
2 students with alternative arrangements will need a separate room booking.

Modules(s)

**Business & Management Foundation**  
 F203E4\_UNMC - The World Economy

**Department of Architecture and Built Environment**  
 K11IDA - Integrated Design in Architecture

**Department of Chemical and Environmental Engineering**  
 H82PLD\_UNMC - Plant Design  
 H84PSD\_UNMC - Process Synthesis and Design

**Department of Chemical, Environmental and Mining Engineering**  
 H81PEF - Process Engineering Fundamentals  
 H81SPF - Separation Process Fundamentals  
 H82PLD - Plant Design

Finish

# Solution

## Exam Scheduling

Pre-Exam

Mid-Exam

Post-Exam

### Exam Tasks

-  Jump to Paper
-  Edit Properties
-  Convert to Formative
-  Email Dr Wilkinson

[Home](#) ▶ [Administrative Tools](#) ▶ [Summative Exam Scheduling](#)

## Paper: Test Summative Exam 2

Paper Name	Test Summative Exam 2
Paper Owner	Dr Simon Wilkinson ( <a href="mailto:simon.wilkinson@unsw.edu.au">simon.wilkinson@unsw.edu.au</a> )
Session	2013/14
Module(s)	H81SPF
Exam Duration	60
Cohort Size	<whole cohort>
Sittings	1
Exam Period	May
Barriers Needed	No
Campus	Main Campus
Notes	2 students with alternative arrangements will need a separate room booking.

# Solution Exam Scheduling

Pre-Exam

Mid-Exam

Post-Exam

[Home](#) > [Administrative Tools](#)

<All Labs>

<All Schools>

**Calendar: 2013**

2010

2011

2012

2013

2014

**January**

Mon

Tue

Wed

Thu

Fri

**1**

**2**

**3**

**4**

**7**

**8**

**9**

**10**

**11**

9:30 AM Re-sit Summative Numeracy PR123 (September 2012)  
9:30 AM B73 CPP Summative Numeracy 3 (September 2012)

9 AM F202P1 Person and Society Final Exam

9 AM B11M01 January 2012-13

10 AM PTI\_MCQ\_2013

**14**

**15**

**16**

**17**

**18**

8:30 AM D11MSK Summative Case Based Assessment 2012-2013 Paper 1  
8:30 AM D11MSK Summative Standalone Assessment 2012-2013 Paper 1  
9 AM A11MBM - UNMC Jan 2013  
10 AM A11BHSJAN20122013  
10 AM B12303 Basic Molecular Pharmacology - First sit  
12:30 PM D11MSK Summative Case Based Assessment 2012-2013 Paper 2  
12:30 PM D11MSK Summative Standalone Assessment 2012-2013 Paper 2

8:30 AM D12GIL Summative Case Based Assessment 2012-2013 Paper 1  
8:30 AM D12GIL Summative Standalone Assessment 2012-2013 Paper 1  
9 AM MM2TF2 computer based test 2012-13  
10 AM A11BST (Body Structure and Function) 2013  
10 AM BPI\_MCQ\_2013  
12:30 PM D12GIL Summative Case Based Assessment 2012-2013 Paper 2  
12:30 PM D12GIL Summative Standalone Assessment 2012-2013 Paper 2

8:30 AM D12ENI (Endocrine) Summative Case Based Assessment 2012-2013  
8:30 AM D12ENI (Endocrine) Summative Standalone Assessment 2012-2013  
9 AM A11HDT UNMC Summative Jan 2012-2013  
10 AM A11HDT 2012/13 January  
10 AM A13 LIP MCQ & SAQ EXAM  
1 PM A11 SD1 Main Paper January 2013  
1:30 PM A12REN: 2012/13 January

9 AM B31ESP Essential Skills for Pharmacists (Part 1) January 2013  
9 AM B31ESP Essential Skills for Pharmacists (Part 2) January 2013  
10 AM MM1EM1 Mid-session Examination 2012-13 Nottingham  
10 AM B31ESP Essential Skills for Pharmacists (Part 1) January 2013  
10 AM B31ESP Essential Skills for Pharmacists (Part 2) January 2013  
1 PM A12REPM Main Paper 2012-13  
1:30 PM FED Rogo Paper

9 AM B32C03 (2012-2013) January UNMC  
10 AM A11PH1 - Public Health & Epidemiology 2012-13  
10 AM B32C03 (2012-2013) January  
1:30 PM Q3107S Viking World 2012/13

Pre-Exam

Mid-Exam

Post-Exam

# Problem Accessibility

How can students with special needs be accommodated?

# Solution Accessibility

Interface support

User profiles

Pre-Exam

Mid-Exam

Post-Exam

Extra Time	<input type="text" value="25%"/>	▼
Font Size	<input type="text" value="140%"/>	▼
Typeface	<input type="text" value="Comic Sans MS"/>	▼
Background Colour	<input type="radio"/> Default	<input checked="" type="radio"/>
Foreground Colour	<input type="radio"/> Default	<input checked="" type="radio"/>
Marks Colour	<input type="radio"/> Default	<input checked="" type="radio"/>
Heading/Theme Colour	<input type="radio"/> Default	<input checked="" type="radio"/>
Labels Colour	<input checked="" type="radio"/> Default	<input type="radio"/>
Unanswered	<input checked="" type="radio"/> Default	<input type="radio"/>

Save

## Cities

1. Which of the following are European cities?

True False

- |                       |                                  |          |
|-----------------------|----------------------------------|----------|
| <input type="radio"/> | <input checked="" type="radio"/> | London   |
| <input type="radio"/> | <input type="radio"/>            | New York |
| <input type="radio"/> | <input checked="" type="radio"/> | Paris    |

(3 marks)

Pre-Exam

Mid-Exam

Post-Exam

# Problem

## Poor Questions

How can questions be excluded quickly?

Paper pass mark re-calculated?

Audit trail of the exclusion?

# Solution

## Poor Questions

### Rashes in Pregnancy

3. A woman presents at 36 weeks with presumed chicken pox, having recently been exposed to the infection in a friend's child.

- ✍ p=0.96 d=0.05📉 t=96% u=98% l=93% **EE True** Does this rash appear consistent with chicken pox?
- ✍ p=0.79 d=0.25 t=79% u=91% l=66% **MI False** In the antenatal population, 50% will be sero positive "immune"
- ✍ p=0.20📉 d=-0.09📉 t=20% u=18% l=27% **EI False** The incubation period is 7-10 days
- ✍ p=0.71 d=0.16 t=71% u=82% l=66% **MN True** Smokers are more likely to suffer from complications of infection
- ✍ p=0.60 d=0.05📉 t=60% u=64% l=59% **MN True** Chicken pox in the first trimester leads to fetal varicella syndrome in 1-2% of cases

# Solution

## Poor Questions

### Rashes in Pregnancy

3. A woman presents at 36 weeks with presumed chicken pox, having recently been exposed to the infection in a friend's child.

- ✍ p=0.96 d=0.05📉 t=96% u=98% l=93% **EE True** Does this rash appear consistent with chicken pox?
- ✍ p=0.79 d=0.25 t=79% u=91% l=66% **MI False** In the antenatal population, 50% will be sero positive "immune"
- ✍ p=0.20📉 d=-0.09📉 t=20% u=18% l=27% **EI False** ~~The incubation period is 7-10 days~~
- ✍ p=0.71 d=0.16 t=71% u=82% l=66% **MN True** Smokers are more likely to suffer from complications of infection
- ✍ p=0.60 d=0.05📉 t=60% u=64% l=59% **MN True** Chicken pox in the first trimester leads to fetal varicella syndrome in 1-2% of cases

Pre-Exam

Mid-Exam

Post-Exam

# Solution Poor Questions

Student marks adjusted

Paper total adjusted

Pass Mark adjusted

Audit trail

## Summary

Paper	A14ONG December 2008/09	
Cohort Size	164	
# Failures	0 (0% of cohort)	
# Passes	13 (8% of cohort)	
# Distinctions	151 (92% of cohort)	
Total available Marks	<del>420</del>	119
Pass Mark	50%	
Mean Mark	94.1 (79.1%)	
Median Mark	95 (79.8%)	
StDev Mark	6.44 (5.41%)	
Max Mark	105 (88%)	
Min Mark	76 (64%)	
Range	29 (24%)	
Average Time	01:19:04	
Excluded Questions	Q3c	

Pre-Exam

Mid-Exam

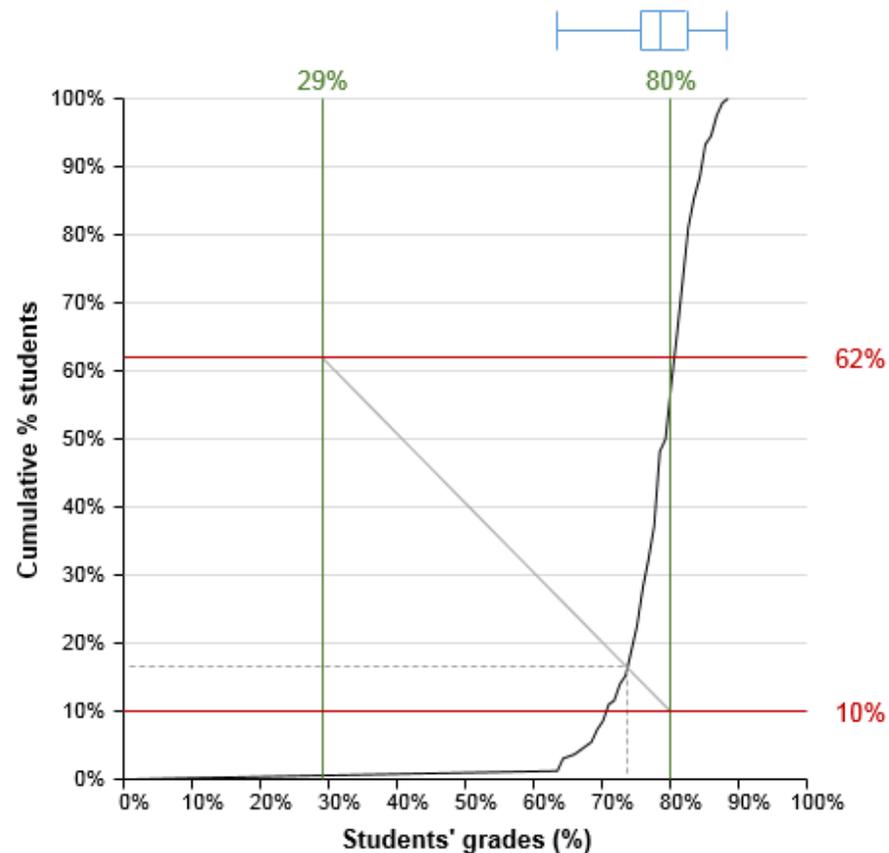
Post-Exam

# Problem Standard Setting

How to speed up the Hofstee process?

# Solution

## Standard Setting



Min Pass	Max Pass	Min Fail	Max Fail	Cut Score
29%	80%	10%	62%	73.6%

# Problem Feedback

Pre-Exam

Mid-Exam

Post-Exam

Did I pass?  
What is my score?  
What did I get right/wrong?  
How do I compare?



**Students**

# Problem Feedback

Pre-Exam

Mid-Exam

Post-Exam



Question reuse is good practice!  
Avoid questions in 'public domain'!  
No time to rewrite paper each year!  
No time for personal tutorials!

**Staff**

# Solution

## Feedback – low score

### A14ONG December 2008/09

Feedback

● Acquisition of 80-100% of specific objective

■ Acquisition of 50-79% of specific objective

▼ Acquisition of 0-49% of specific objective

Relative - number of marks above '+' or below '-' relative to the mean of the cohort

Q no - number of questions mapped to objective

#### Learning Objectives

Below is a list of all the unique learning objectives tested by this paper. Because multiple questions may test the same objective it is possible to have partial acquisition of an objective. Use the results below to concentrate on red ▼ and amber ■ objectives you have not fully mastered.

	Your Mark	Relative	Q no	Objective
●	4 out of 4	+0.1	1	demonstrate a knowledge of the physiology of the adaptation of the neonate to extrauterine life
●	4 out of 4	+0.1	1	understand management of labour and normal delivery, including the third stage
●	5 out of 6	-0.3	2	explain the nature of the problems to the patient and plan appropriate action
●	4 out of 5	-0.3	1	describe the antenatal investigations available for assessing the wellbeing of the fetus
●	4 out of 5	-0.1	1	identify high risk groups
■	7 out of 9	-0.2	2	identify the normal
■	8 out of 11	-0.7	3	interpret the investigation findings and establish the fetal wellbeing
■	10 out of 14	-1.4	3	develop skills to recognise recurrent factors and risk factors in obstetric and medical histories
■	20 out of 33	-5.3	8	recognise common problems that might complicate pregnancy
■	2 out of 4	-1	1	recognise abnormal examination findings in the pregnant patient
▼	2 out of 5	-1.6	1	demonstrate a knowledge of the prognosis for individual patients
▼	2 out of 5	-1.6	1	interpret clinical symptoms and signs
▼	2 out of 5	-1.6	1	pathogenic organisms in the genital tract
▼	2 out of 5	-2.2	1	recognise abnormalities in labour and plan appropriate management
▼	2 out of 5	-1.6	1	the impact of sexual behaviour on vaginal and pelvic infection

# Solution

## Feedback – mid score

### A14ONG December 2008/09

Feedback

● Acquisition of 80-100% of specific objective

■ Acquisition of 50-79% of specific objective

▼ Acquisition of 0-49% of specific objective

Relative - number of marks above '+' or below '-' relative to the mean of the cohort

Q no - number of questions mapped to objective

#### Learning Objectives

Below is a list of all the unique learning objectives tested by this paper. Because multiple questions may test the same objective it is possible to have partial acquisition of an objective. Use the results below to concentrate on red ▼ and amber ■ objectives you have not fully mastered.

	Your Mark	Relative	Q no	Objective
●	5 out of 5	+1.4	1	demonstrate a knowledge of the prognosis for individual patients
●	5 out of 5	+0.7	1	describe the antenatal investigations available for assessing the wellbeing of the fetus
●	6 out of 6	+0.7	2	explain the nature of the problems to the patient and plan appropriate action
●	5 out of 5	+1.4	1	interpret clinical symptoms and signs
●	5 out of 5	+1.4	1	pathogenic organisms in the genital tract
●	5 out of 5	+0.8	1	recognise abnormalities in labour and plan appropriate management
●	5 out of 5	+1.4	1	the impact of sexual behaviour on vaginal and pelvic infection
●	10 out of 11	+1.3	3	interpret the investigation findings and establish the fetal wellbeing
●	8 out of 9	+0.8	2	identify the normal
●	12 out of 14	+0.6	3	develop skills to recognise recurrent factors and risk factors in obstetric and medical histories
●	4 out of 5	-0.1	1	identify high risk groups
■	25 out of 33	-0.3	8	recognise common problems that might complicate pregnancy
■	3 out of 4	-0.9	1	demonstrate a knowledge of the physiology of the adaptation of the neonate to extrauterine life
■	3 out of 4	0	1	recognise abnormal examination findings in the pregnant patient
■	3 out of 4	-0.9	1	understand management of labour and normal delivery, including the third stage

# Solution

## Feedback – good score

### A14ONG December 2008/09

Feedback

- Acquisition of 80-100% of specific objective
- Acquisition of 50-79% of specific objective
- ▼ Acquisition of 0-49% of specific objective

**Relative** - number of marks above '+' or below '-' relative to the mean of the cohort  
**Q no** - number of questions mapped to objective

#### Learning Objectives

Below is a list of all the unique learning objectives tested by this paper. Because multiple questions may test the same objective it is possible to have partial acquisition of an objective. Use the results below to concentrate on red ▼ and amber ■ objectives you have not fully mastered.

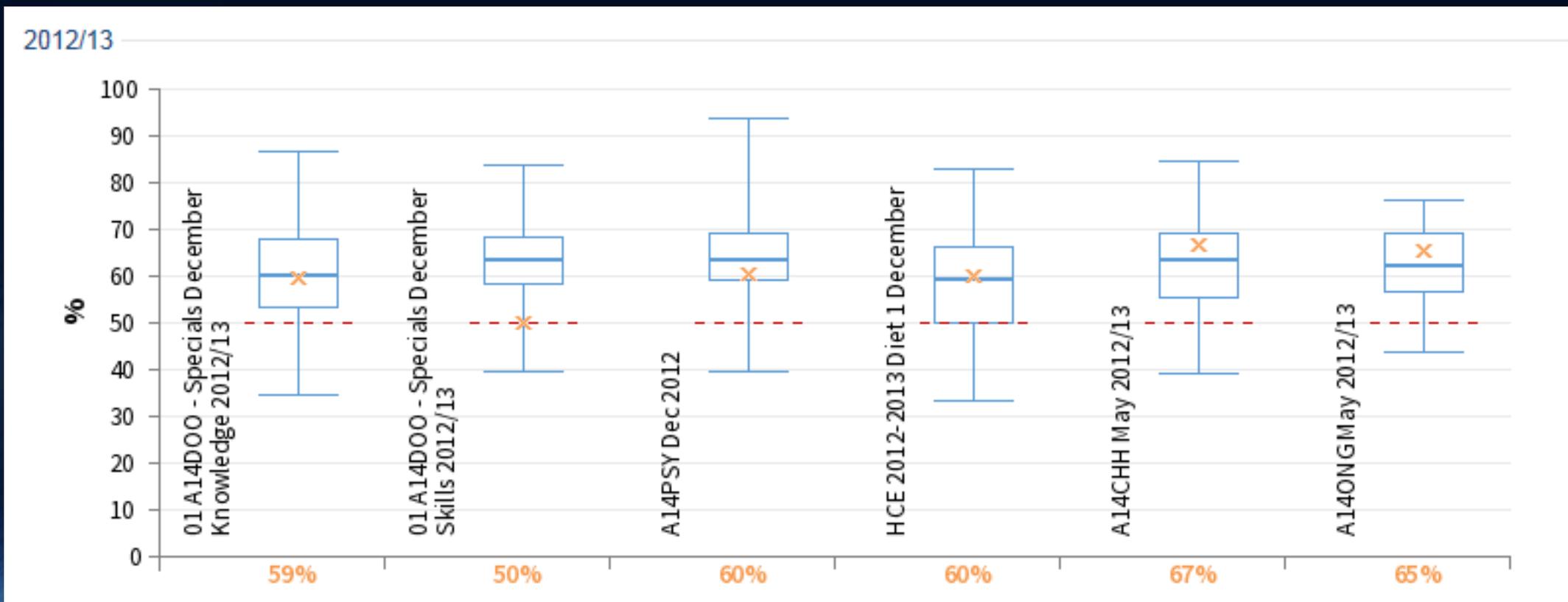
	Your Mark	Relative	Q no	Objective
<span style="color: green;">●</span>	4 out of 4	+0.1	1	demonstrate a knowledge of the physiology of the adaptation of the neonate to extrauterine life
<span style="color: green;">●</span>	5 out of 5	+1.4	1	demonstrate a knowledge of the prognosis for individual patients
<span style="color: green;">●</span>	5 out of 5	+0.7	1	describe the antenatal investigations available for assessing the wellbeing of the fetus
<span style="color: green;">●</span>	14 out of 14	+2.6	3	develop skills to recognise recurrent factors and risk factors in obstetric and medical histories
<span style="color: green;">●</span>	6 out of 6	+0.7	2	explain the nature of the problems to the patient and plan appropriate action
<span style="color: green;">●</span>	5 out of 5	+0.9	1	identify high risk groups
<span style="color: green;">●</span>	5 out of 5	+1.4	1	interpret clinical symptoms and signs
<span style="color: green;">●</span>	5 out of 5	+1.4	1	pathogenic organisms in the genital tract
<span style="color: green;">●</span>	5 out of 5	+0.8	1	recognise abnormalities in labour and plan appropriate management
<span style="color: green;">●</span>	5 out of 5	+1.4	1	the impact of sexual behaviour on vaginal and pelvic infection
<span style="color: green;">●</span>	4 out of 4	+0.1	1	understand management of labour and normal delivery, including the third stage
<span style="color: green;">●</span>	31 out of 33	+5.8	8	recognise common problems that might complicate pregnancy
<span style="color: green;">●</span>	9 out of 11	+0.3	3	interpret the investigation findings and establish the fetal wellbeing
<span style="color: orange;">■</span>	7 out of 9	-0.2	2	identify the normal
<span style="color: orange;">■</span>	3 out of 4	0	1	recognise abnormal examination findings in the pregnant patient

Pre-Exam

Mid-Exam

Post-Exam

# Solution Performance Summary



# Conclusion

Purpose

Process

People



Open Source