Does more face to face time enhance attainment?
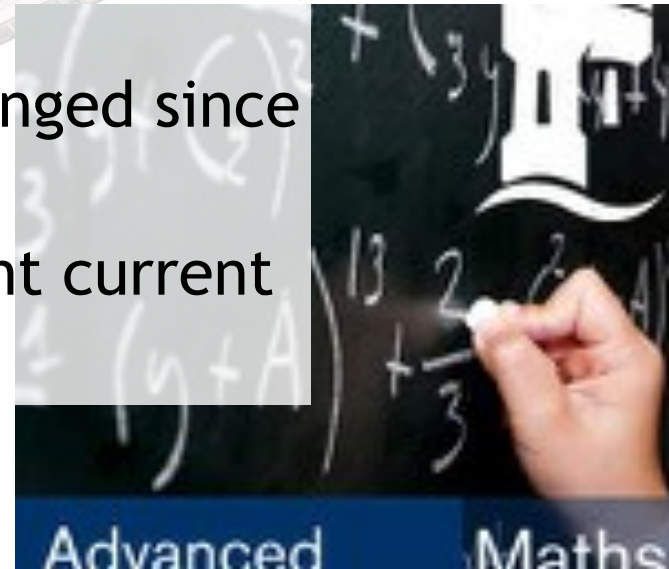
Janet Bonar and Simon Saggers

Engineering Group, School of Technology

Presentation Overview

■ Introduction

■ How we teach maths, and to whom

■ What we monitor

■ How we assess

■ Results of monitoring, tests, exams

■ Correlation of engagement and results?

■ Is our teaching method successful?

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Introduction

- Engineering is important for UK economy
- Mathematics underlies engineering
- Educating engineers requires education in maths
- Maths not popular subject!
- Fundamentals of mathematics unchanged since Euclid's time
- Is our way of teaching maths at Solent current best practice?

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How we teach maths, and to whom

■ Maths unit taught at level 4, embedded at levels 5 and 6.

Unit	Degree	students	Accreditation?
EMS400	BEng	46	Accredited by IET
EMS401	BSc	28	Not currently accredited (new course)

■ One hour lecture

■ Two hour tutorial (quiz, problem set, HW)

■ One hour student support (student's requests)

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What we monitor
How we assess

- Engagement data: Attendance, attempts at HW, weekly quiz score

- Phase Tests covering single topic (pre-calculus, complex numbers, linear algebra, calculus and applications of calculus)

- Best 4 phase tests contribute 40% to unit result

- Exam covering all topics at year end, contributes 60% to unit result

- Minimum of 30% in each assessment (required by IET accreditation)

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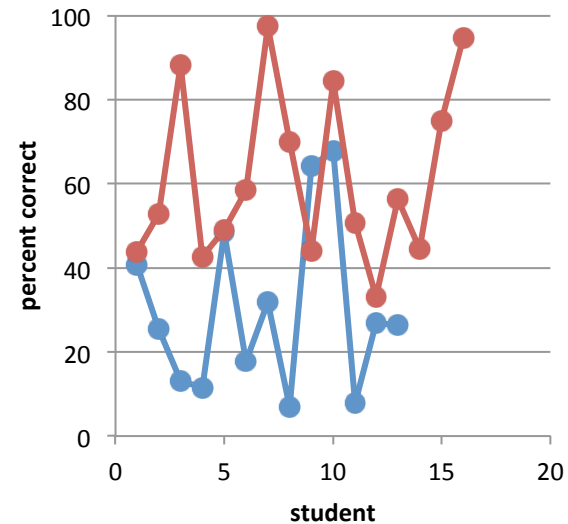# Engagement data for BSc unit
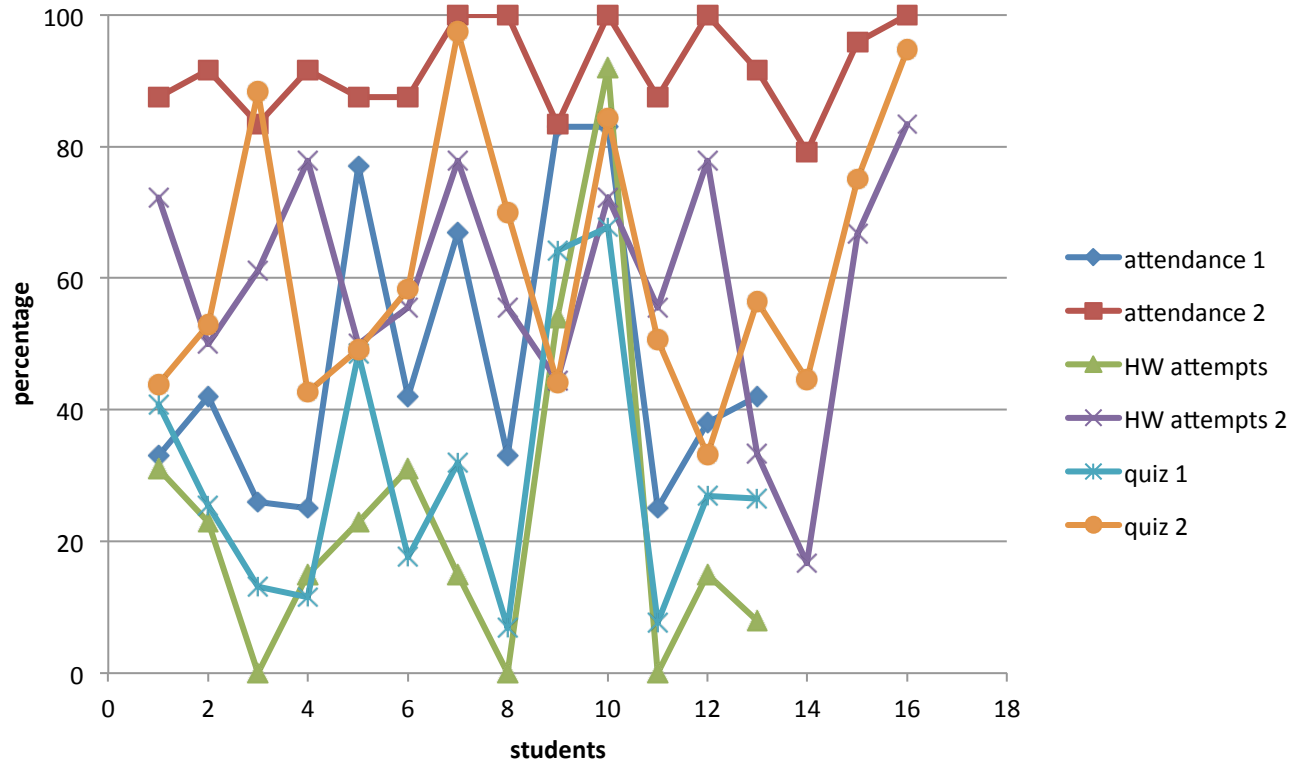
■ Engagement data: Attendance, attempts at HW, weekly test score by student
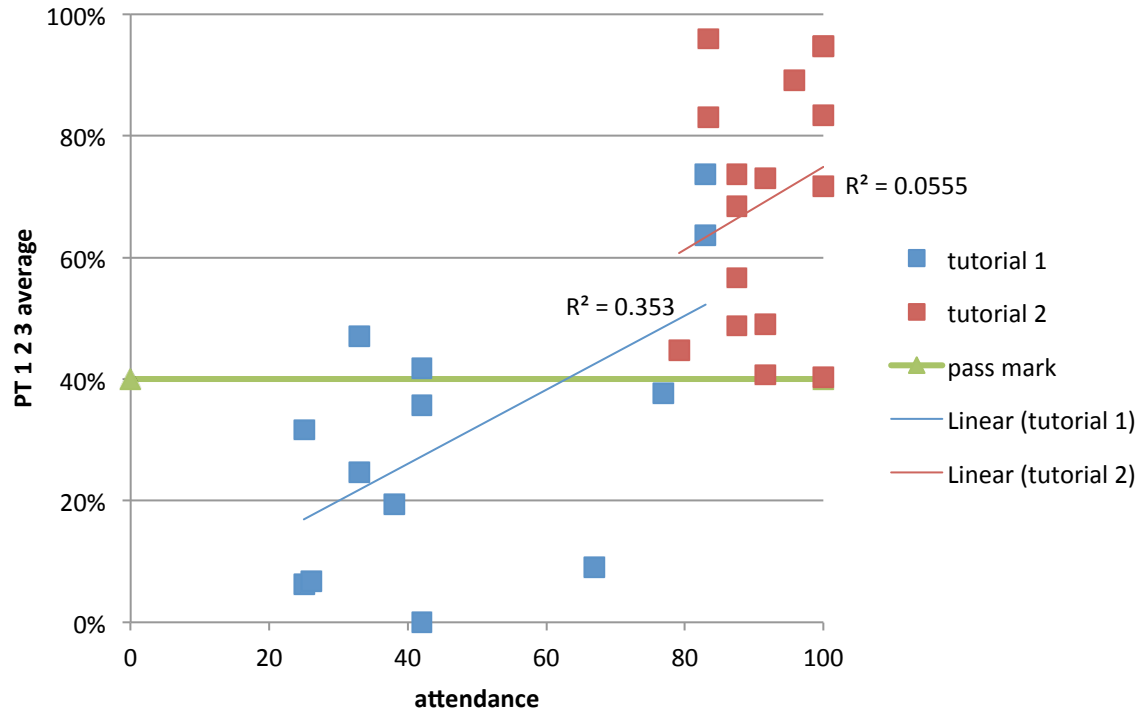
Engagement data for BSc unit
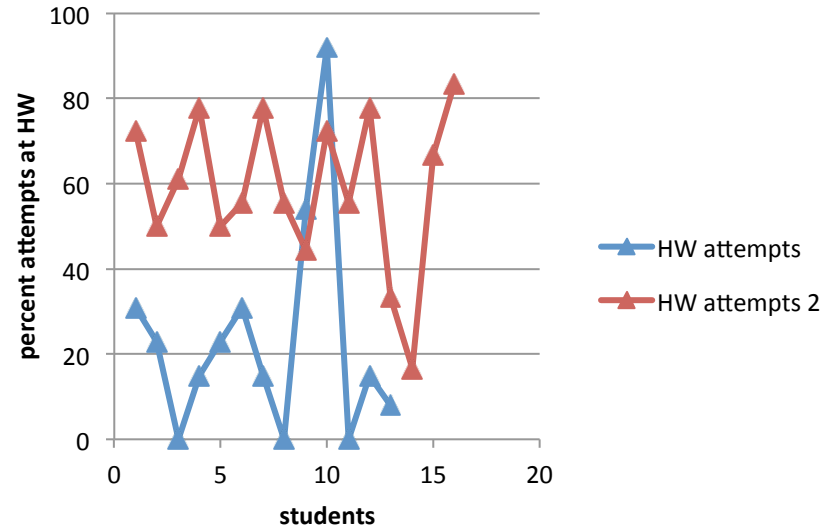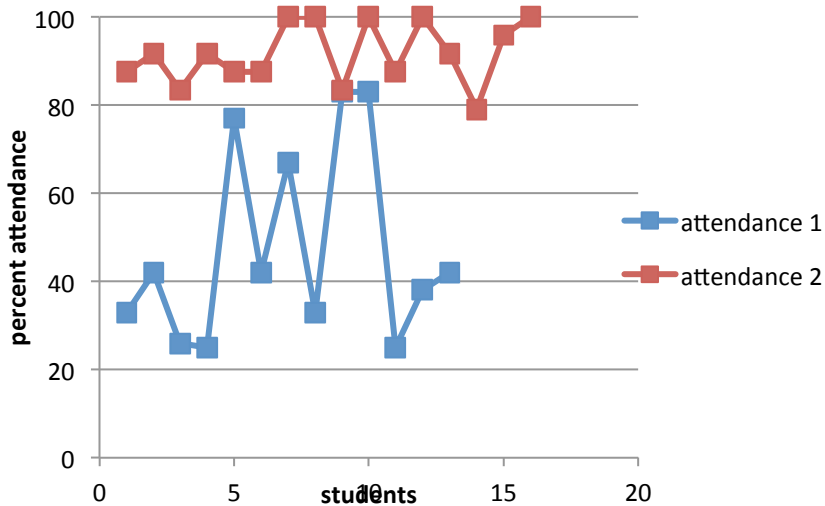
Engagement data: Attendance, attempts at HW, weekly test score by student

Engagement data and first 3 phase tests

- Correlation of attendance with Phase Test for first 3 tests
- Difference in tutorial groups apparent!

Observations from engagement data

- Two tutorials running for BSc unit
- Engagement and attainment data plotted by tutorial
- Different tutorial groups behave very differently!

- ➤ Tutorial 1: f/t students
- ➤ Tutorial 2: p/t HNC students on day release from local engineering companies
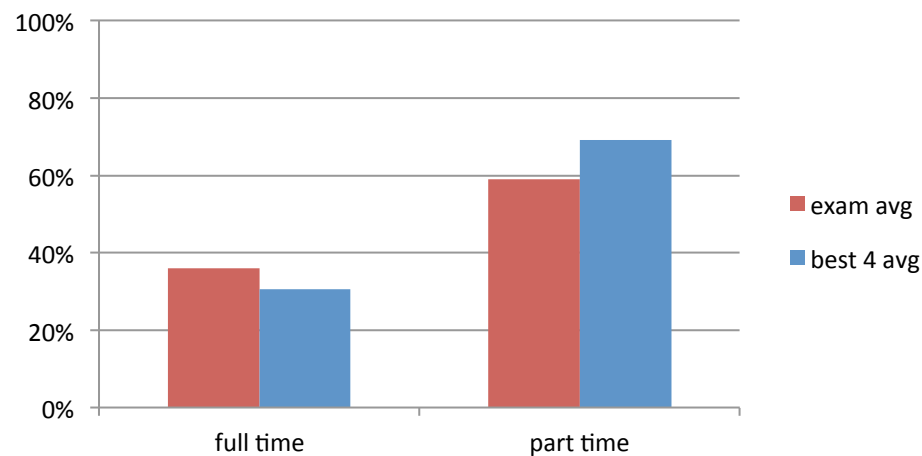
Phase test results

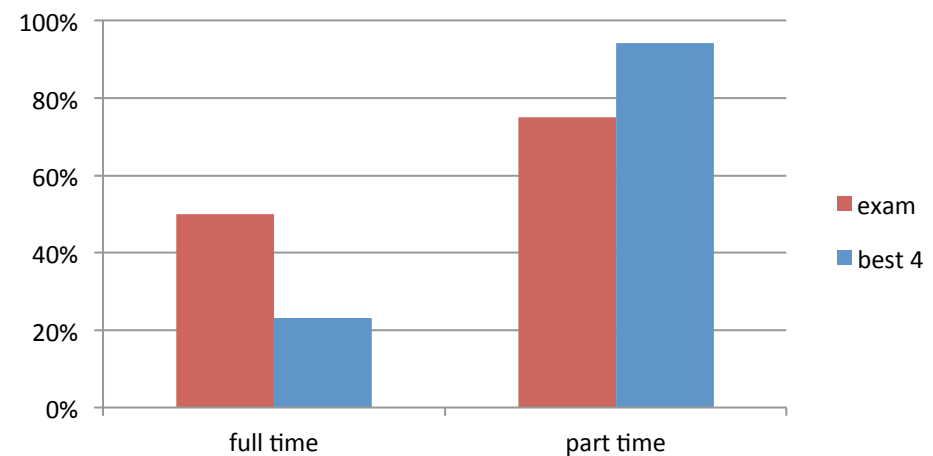ESM401 phase test best 4 and pass rate
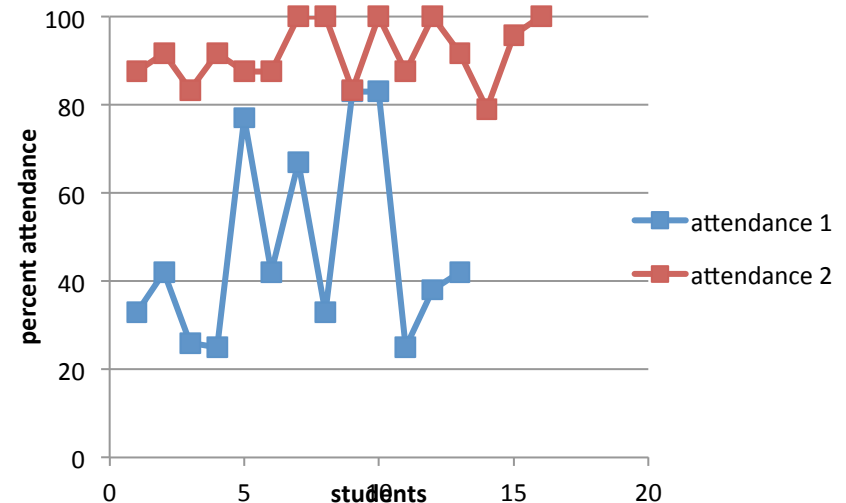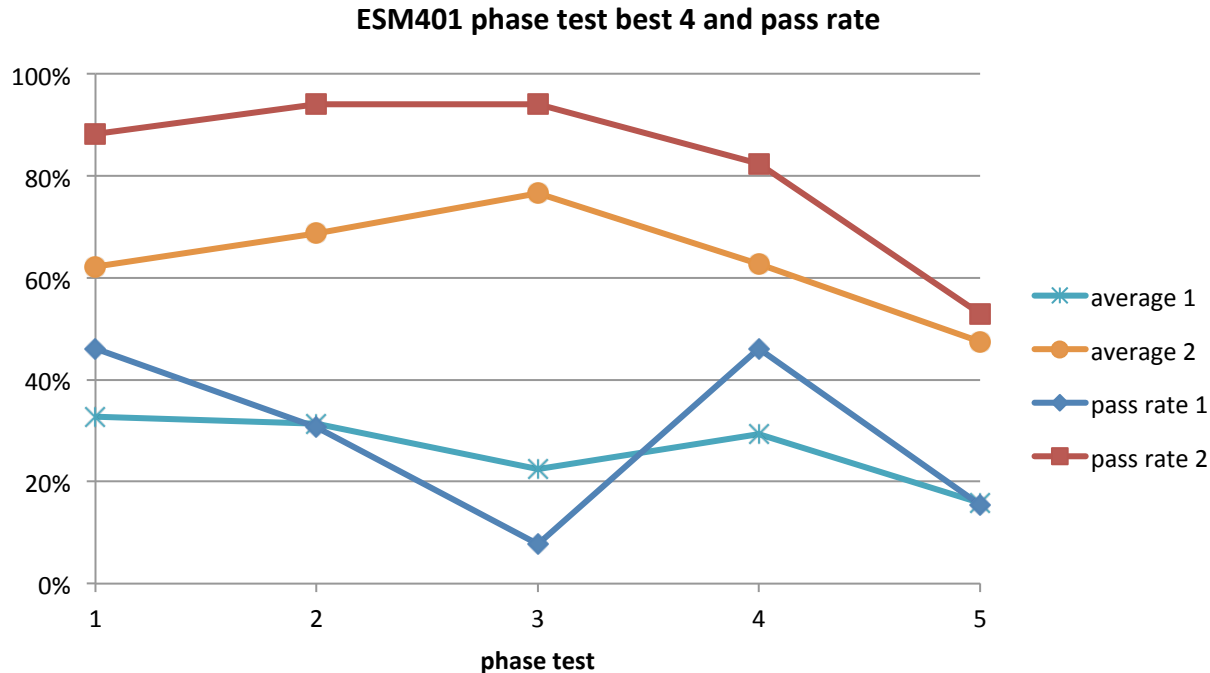
- Both p/t and f/t students found calculus and applications of calculus more difficult!
- Other differences in between p/t and f/t more difficult to identify

Unit Assessment: Best 4 phase test average and exam results

phase test and exam avg

phase test best 4 and exam pass rate

- Difference in attainment between tutorial groups apparent for exam as well as phase test assessment.

- F/t students better achievement on exam, p/t better achievement on phase tests

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What does matter and what doesn't?

- Full-time and part-time students have different engagement and achievement patterns

➢ P/t students attend less but are more engaged and achieve better results

➢ Students in full-time employment on day release more likely to be committed to blend of studying and learning, are expected by their sponsors to attend and achieve, and may be better at maths than the average student.
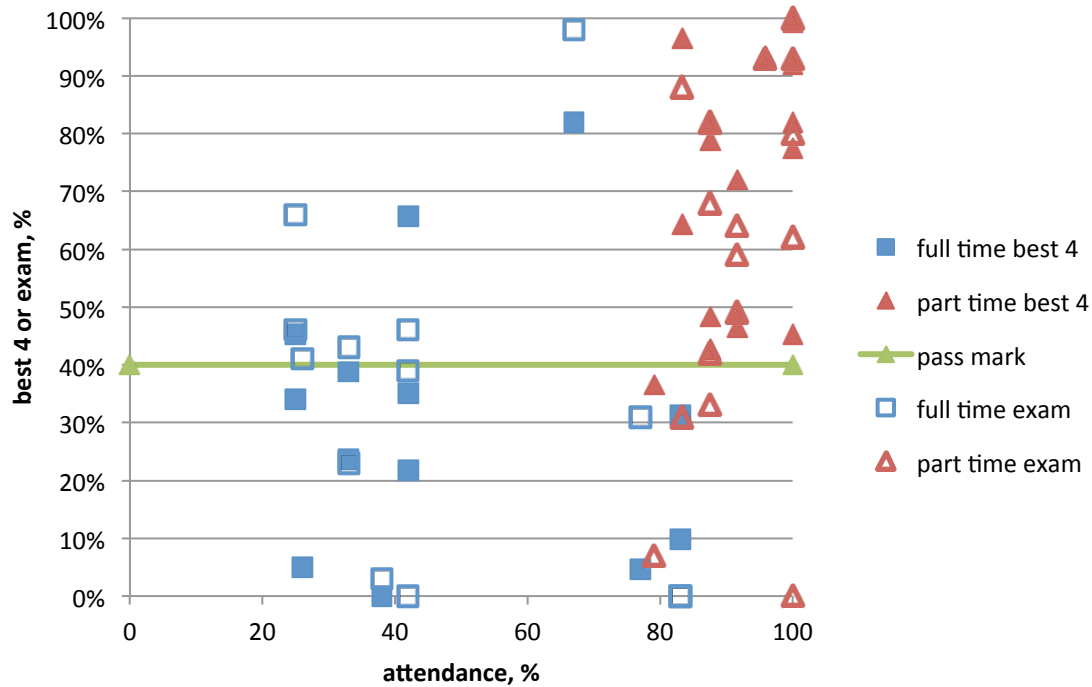
What else matters?
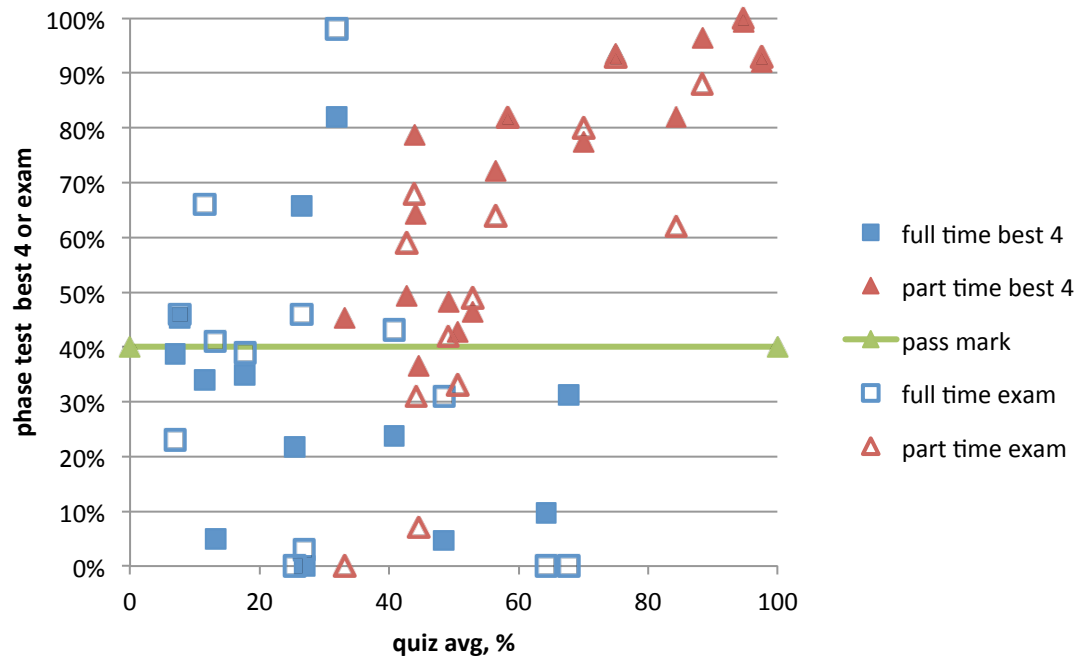
■ Engagement data with best 4 phase test and exam result: weekly quiz achievement
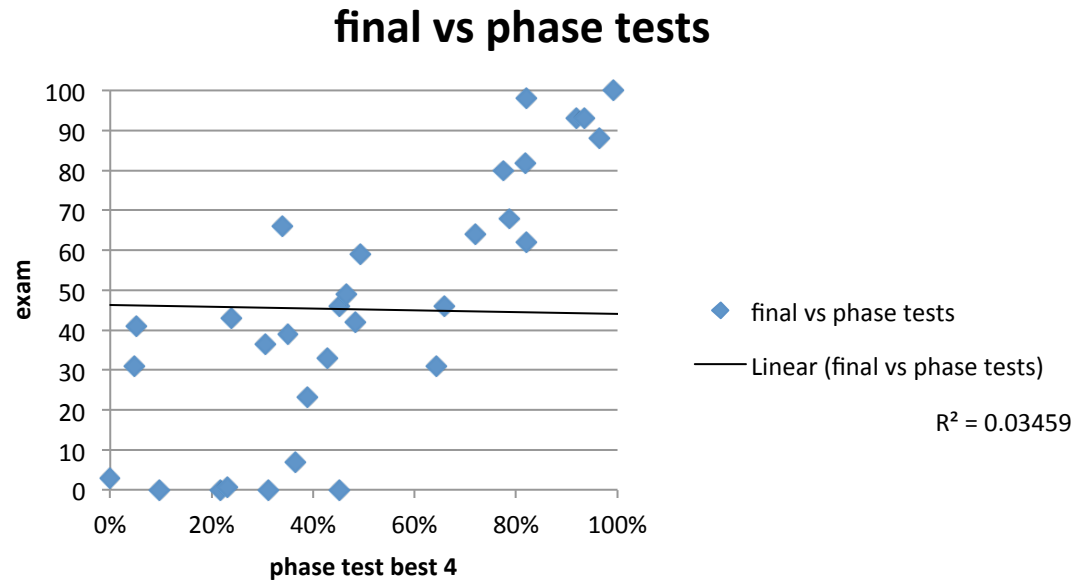
What else matters?
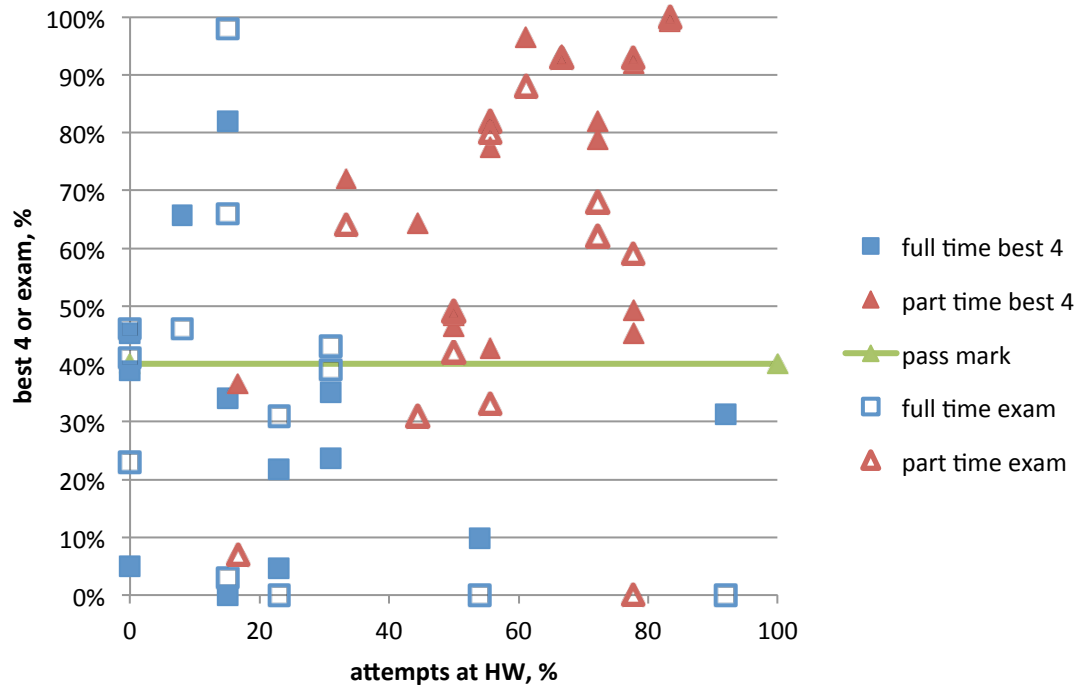
- Engagement data with best 4 phase test and exam result: attempts at HW

What else matters?

■ Engagement data with best 4 phase test and exam result: attendance

Is phase test a good predictor for exam result?

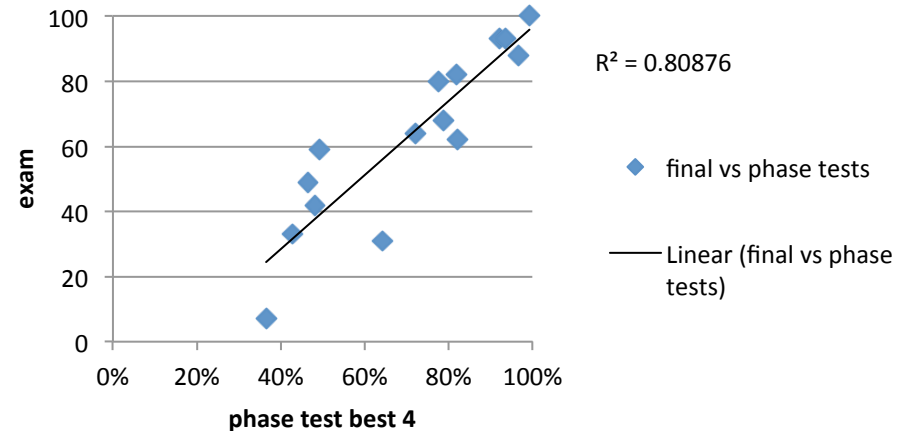**final vs phase tests**

Not particularly strong correlation when whole population considered

Is phase test a good predictor for exam result?

final vs phase tests--tutorial 1
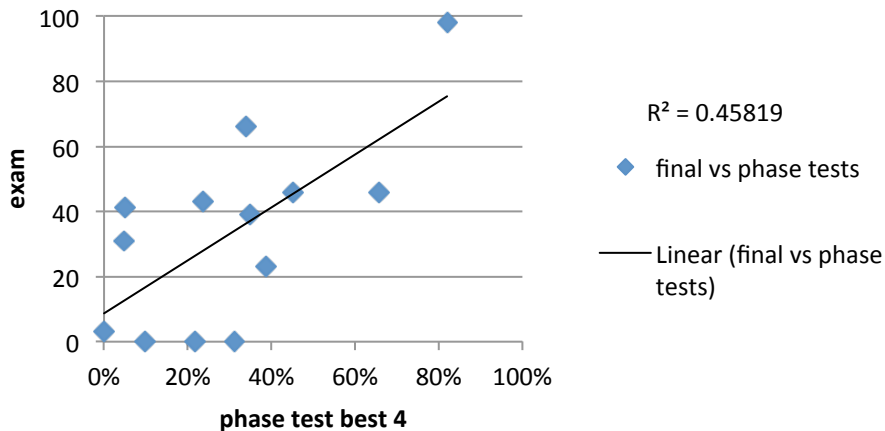
final vs phase tests--tutorial 2

$R^2 = 0.45819$

$R^2 = 0.80876$

- Difference in correlation between phase tests and exam results for p/t than for f/t students.
- Correlation is fairly strong for p/t students

What else matters?

- Difference between f/t and p/t students clear
- No obvious correlation between engagement data and phase test or exam for f/t or p/t students
- Moderate correlation between phase test and exam results for p/t students
- Need more sophisticated analysis?

What else matters?

■ PCA* used to look for correlations

➢ F/t and p/t population difference clear

➢ Some correlation between exam and phase tests 4 and 5

➢ Some correlation between phase tests 1, 2, and 3 and engagement data

*Principal Component Analysis is the simplest of the true eigenvector-based multivariate analyses. Often, its operation can be thought of as revealing the internal structure of the data in a way that best explains the variance in the data.

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Does our method work?

Degree	2012-2013 Pass rate	2013-2014 pass rate
BEng	49%	70%
BSc	---	61%

- BEng pass rate significantly increased in 2013-14 compared to 2012-13

- BSc pass rate higher 2013-14 than BEng pass rate 2012-13

- Teaching and learning for level 4 maths working better across the whole population

Does our method work?

- Teaching and learning for level 4 maths unit is:
  - ➢ Good for p/t students
  - ➢ Good for BEng students
  - ➢ Not so good for f/t BSc students
- Monitoring correct data—poorly performing students picked up on engagement data and phase tests
- Need to find more effective way to act on monitoring data and get f/t BSc students more engaged and achieving better

Acknowlegements:

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Questions?

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