Using e-Assessment to assess and support learning for Engineers

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Outline of talk

- Overview of the e-Assessment system used: DEWIS
- Structure of the first year of the Engineering degree at UWE
- Details of the e-Assessment approach for three 30 credit first year Engineering modules
  - Practice Tests
  - Intelligent Marking
  - Delayed Feedback
- Summary and future plans.

What is DEWIS?

- **DEWIS** is an algorithmic e-Assessment system.
  - Designed and developed at UWE, first implemented in 2007 and it is supported by the university. A completely stand-alone web based system for both summative and formative assessments.
  - Primarily designed for numerate e-assessments; at UWE currently used in the fields of:
    - Business
    - Computer Science
    - Engineering
    - Mathematics
    - Nursing

    for formative and summative assessments.
  - For more information, see **www.cems.uwe.ac.uk/caa**

Mechanical Engineering degree (1st year) at UWE, Bristol

- Curriculum refresh exercise in 2011/12
- Streamlined to comprise three 30 credit modules and two 15 credit modules.
- Student numbers have increased substantially in recent years.
- ***Needed e-Assessment in order to enhance the student (& staff) experience***.

Engineering Mathematics (Mech, Aero, Elec, Motorsport & Robotics) 275 students

Stress & Dynamics (Mech, Aero & Motorsport) 200 students

Design, Materials & Manufacturing (Mech, Aero & Motorsport) 200 students

Engineering Maths

E-Assessment used on this module for more than 10 years. QMP and then DEWIS.

Six small e-Assessments throughout the year covering the whole syllabus. Typically each contain 10-15 short mathematical questions.

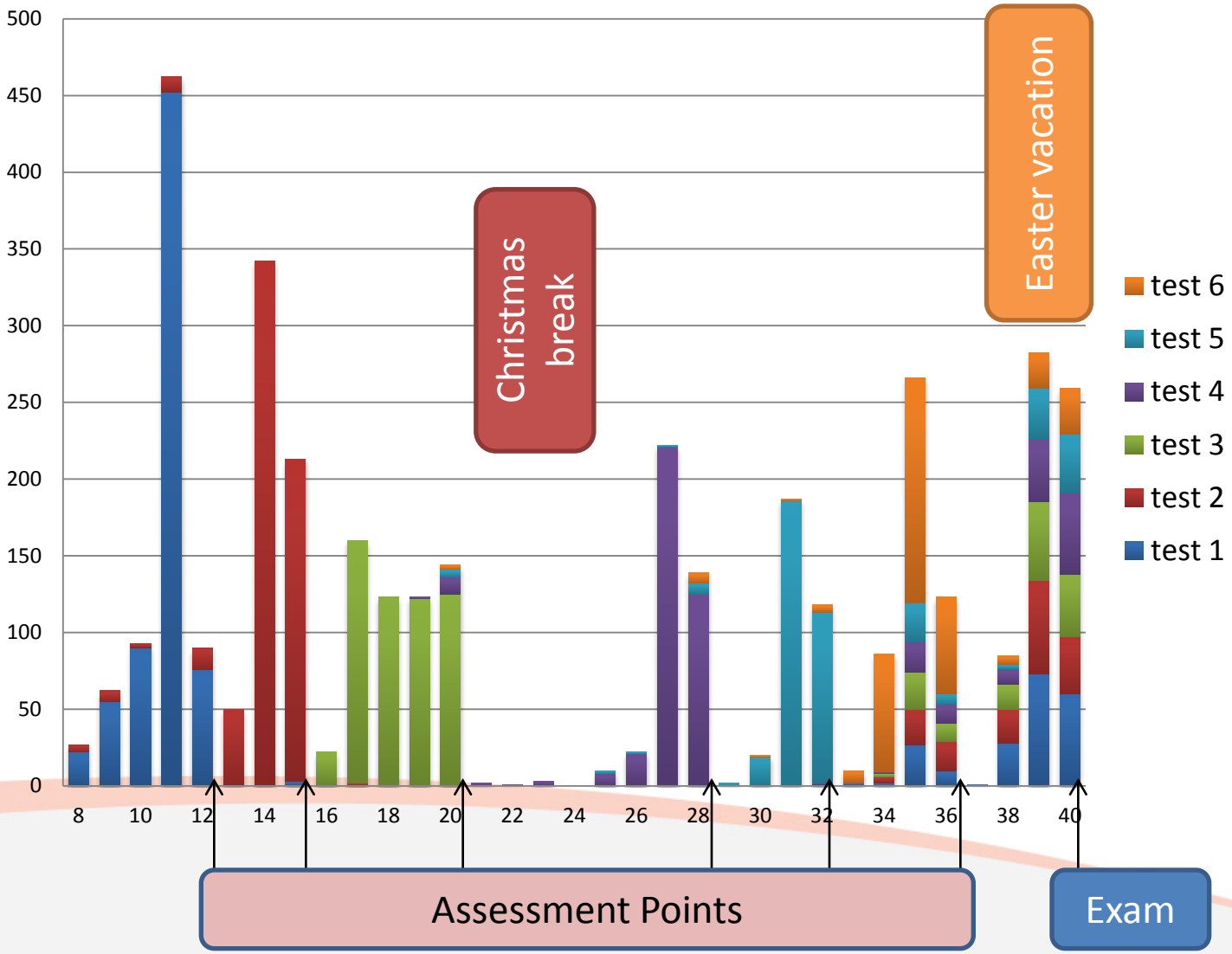
Practice mode: Students can access the tests anonymously as many times as they like prior to the summative e-Assessment going live.

Assessment mode: Students are given 2 attempts over an 11 day period to attempt the test. Their mark and full feedback available immediately after submission and their highest mark counts.

All six e-Assessments are re-opened for one further summative attempt at the end of the year.

Revision: All six practice tests re-opened for revision purposes prior to the exam in May.

Practice test usage



2012/13	UFMFJ9-30-1		Tests	Exam	Total numbers
Six DEWIS e-Assessments and associated practice tests. CW included Matlab.		Average mark	72.4	49.7	248
		Pass rate	93.3	66.5	
		Module pass rate			72%
2011/12	**UFMF5D-20-1**		**Tests**	**Exam**	**Total numbers**
Six DEWIS e-Assessments and associated practice tests.		Average mark	79.4	50.2	237
		Pass rate	93.7	69.9	
		Module pass rate			82%
2010/11	**UFQETH-10-1**		**Tests**	**Exam**	**Total numbers**
Weekly DEWIS practice tests introduced with extensive feedback. Two DEWIS e-Assessments.		Average mark	66.7	64	254
		Pass rate	85.2	85.0	
		Module pass rate			81%
2009/10	**UFQETH-10-1**		**Tests**	**Exam**	**Total numbers**
Two QMP e-Assessments.		Average mark	68.6	43.5	250
		Pass rate	88.7	52.0	
		Module pass rate			57%

Student views

92% found the DEWIS tests useful.

Please comment on the best aspects of the module.

- *The online tests have been very enjoyable, while putting me under some pressure they have been good practice, but also allowing me to get a few extra marks before the exam has been a massive positive for me .*
- *Being given feedback after the online tests has really helped me learn the processes as well as having practice tests.*

Were there any issues which affected your ability to study and engage with this module?

- *The online tests do not show your true ability. Say a question has 3 marks and you get the right numbers but put them in the wrong boxes then you loose (sic) all of the marks instead of getting 1 or 2 marks.*

Stress & Dynamics

E-Assessment first used on this module in 2011/12. DEWIS.

Two summative e-Assessments, one on Stress (Semester 1) and one on Dynamics (Semester 2).

Stress: Large compound question based on laboratory work.

Each student receives an individual assignment via the DEWIS system, a fortnight prior to the assessment deadline (submission is disabled)

A week before the assessment deadline the Submission version is enabled and students have one chance to submit their answers.

The release of the student's mark and feedback is delayed until after the assessment deadline.

Algorithmic marking process (intelligent marking).

Dynamics: Contains shorter questions. Two attempts. Mark given, but feedback delayed. No practice test available.

Intelligent marking

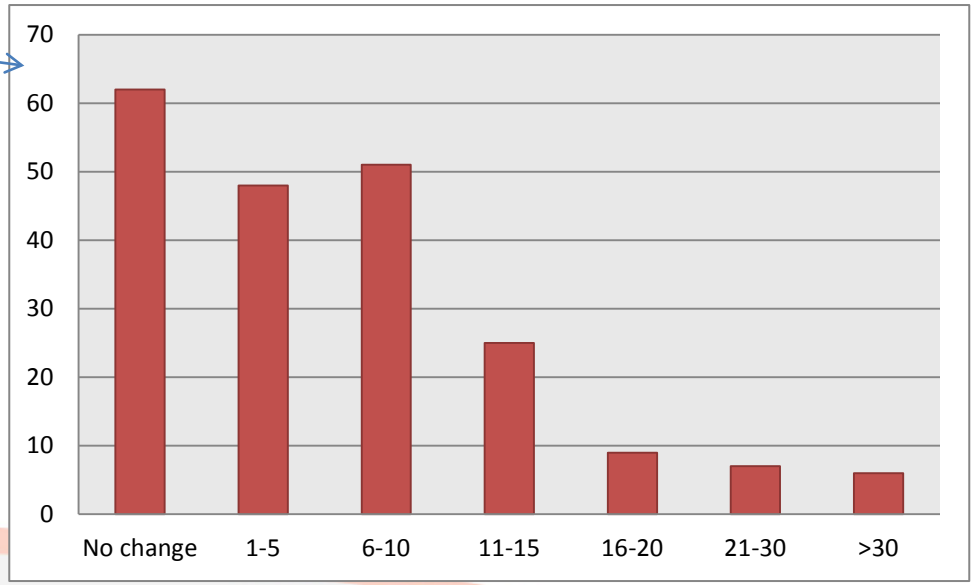
- With the *DEWIS* fully algorithmic approach the solution algorithm and marking algorithm may communicate in order to support continuation marking based on the student's input.
- Fairer to the student and is much more representative of how a human would mark.

Input	Description of question	Description of outcomes
1	Shear Force diagram	correct | incorrect
2	Bending Moment diagram	correct | continuation (Input 1) | wrong sign | incorrect
3	Bending moment, M	correct | continuation (Input 2) | units error | incorrect
4,5	Second moment of area, I	correct | orientation error | units error | incorrect
6,7	Radius of curvature to the neutral axis, R_{NA}	correct | orientation error | units error | continuation (M & I) | incorrect
8,9	Radius of curvature to the edge of the beam, R	correct | orientation error | continuation (R_{NA}) | incorrect
10,11	Theoretical deflection, d	correct | orientation error | continuation (R) | incorrect
12,13	Experimental deflection, d	experimental input - no marking
14,15	Percentage error	correct | presentation error | continuation (theoretical d) | incorrect
16,17	Maximum load	correct | orientation error | continuation (I) | incorrect

- 145 (out of 207) students triggered at least one continuation marking process.
- Very few students triggered the orientation error.
- Disabling of the continuation marking process simulates the marking process of a conventional e-assessment system.

Distribution of the percentage differences in students' marks resulting from implementing the continuation marking.

The few students that benefited by more than 30% typically made an error early on in Inputs 3,4 and 5 and/or using the wrong units of measurement.



Design, Manufacturing & Materials

E-Assessment first used on this module in 2011/12. DEWIS.

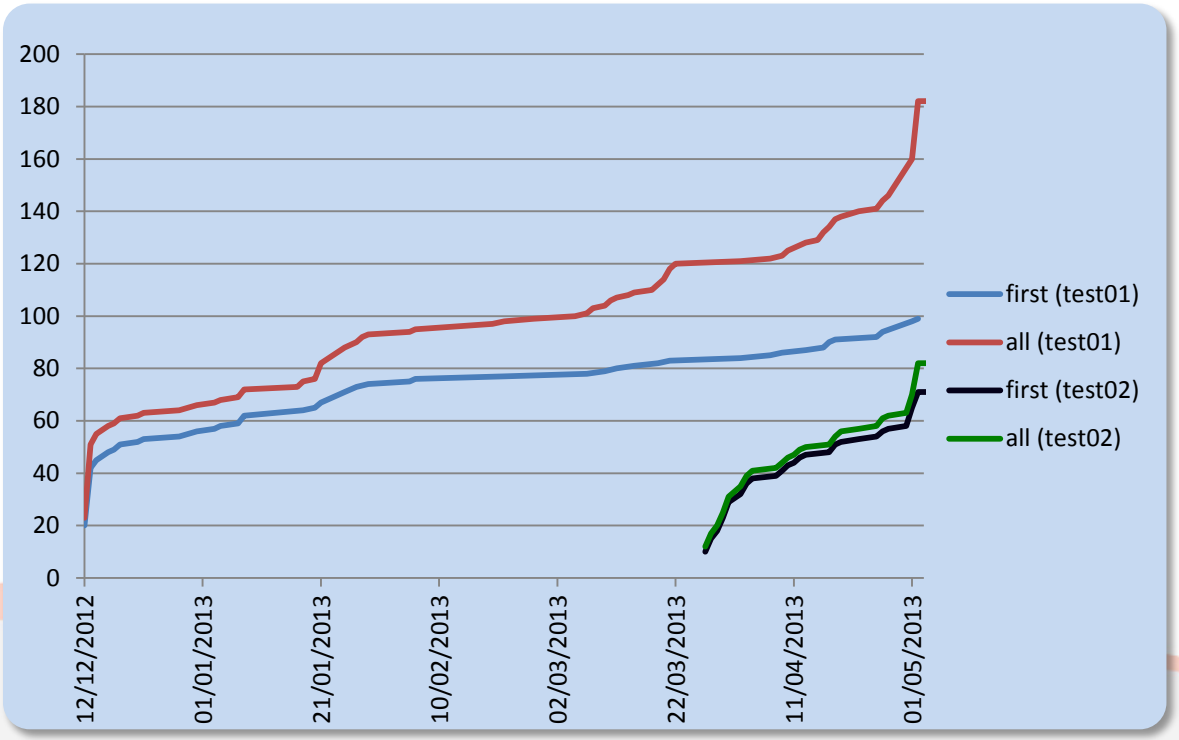
Two summative e-Assessments, one in each Semester. Containing about 6 questions, some with multiple parts.

Assessment mode: Students are given 3 attempts over an 11 day period to attempt the test. Their mark only is available immediately after submission and their highest mark counts. Feedback may be accessed shortly after the submission deadline.

Revision modes: Both tests re-opened for revision purposes in anonymous mode prior to the exam in May.

Result of delaying feedback:

- For test 1, there were 383 attempts from 187 students. Of these only 99 students accessed their feedback.
- For test 2, there were 332 attempts from 183 students. Of these only 72 students accessed their feedback.



Summary

- Able to use the DEWIS e-Assessment system for a variety of assessment formats.
- E-Assessment is popular with students.
- Students need to be given clear guidelines for each e-Assessment.

Plans

- Introduce weekly Practice tests for Engineering maths (4-8 questions) and select several questions from each week to form the summative e-Assessment.
- How to get students to engage more with feedback (SD, DMM).