Bournemouth University

E-Learning Seminar

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Enhancing Design students' engagement in technology-based subjects:

A practical learning and online assessment strategy

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INTRODUCTION

It has been recognised that there is an issue with the motivation of students in design to engage with the technology aspects of their programmes and incorporate technology to a satisfactory level in their design projects.

A technology-enhanced learning strategy has been developed and applied to address this issue.

This includes:

- Online **formative** and **summative assessment** through myBU
- **Practical learning** (linking theory to practice)

CONTEXT

The strategy has been implemented in the Level C Technological Principles Unit:

- Delivered to four programmes across the Design Framework
    - BSc Design Engineering
    - BSc Design Visualisation
    - BSc Product Design
    - BA Product Design

- Approximately 100 students

- Level of maths ability varies from those who have just passed their GCSE to those who have studied A-level maths

ONLINE ASSESSMENT STRATEGY

The online assessment strategy utilises the virtual learning environment myBU.

A number of **formative** assessments have been set up within it that combine both multiple choice and calculated answer questions.

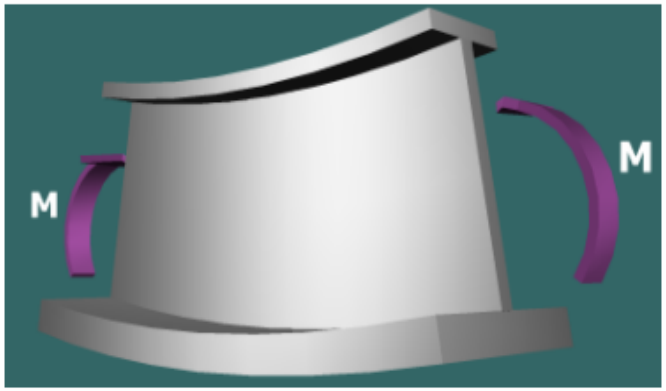
Two online **summative** assessments (75% of unit mark) are run at the end of the Autumn and Spring terms.

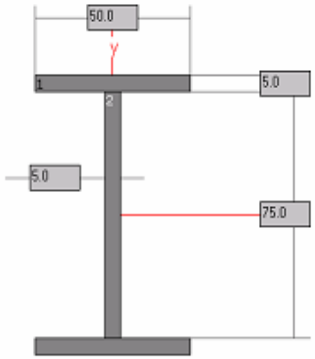
ONLINE ASSESSMENT STRATEGY

myBU allows random variables to be used in the assessments to ensure each student has a different question.

Question 11 **9 points** Save

An I section beam with section properties I_{xx} = 976.82x10^{3}mm^4 and I_{yy} = 104.95x10^{3}mm^4 and cross-section shown below is subjected to a bending moment (M) of 7.15x10^{6}Nmm at a certain point along its length. It is made from aluminium with a modulus of elasticity of 73GPa. What is the maximum stress (in MPa) on the section (to 2 dp)?





Moving to another question will save this response. ◂◂ | ◂ | Question 11 of 12 | ▸ | ▸▸

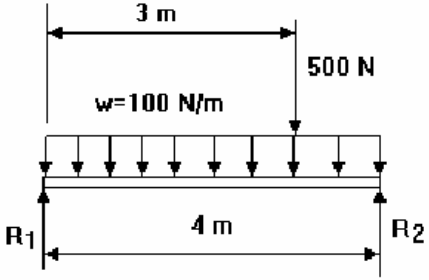
ONLINE ASSESSMENT STRATEGY

Students receive instantaneous feedback (score and hints as to how they should have approached answering each question).

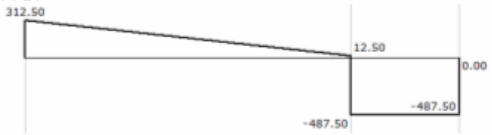
Provides the student with valuable information to reflect upon.

Question 1 Multiple Choice 0 out of 9 points

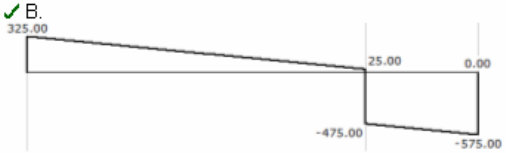
A simply supported beam is loaded as shown below. Which is the correct shear force diagram for this situation?



Given Answer: ✗ D.



Correct Answer: ✓ B.



myBU

Home Help Logout

Home Cont

2009-09 DEC: C - TECHNOLOGICAL PRINCIPLES (040536) > CONTROL PANEL > GRADE CENTER > GRADE DETAILS > MODIFY GRADE

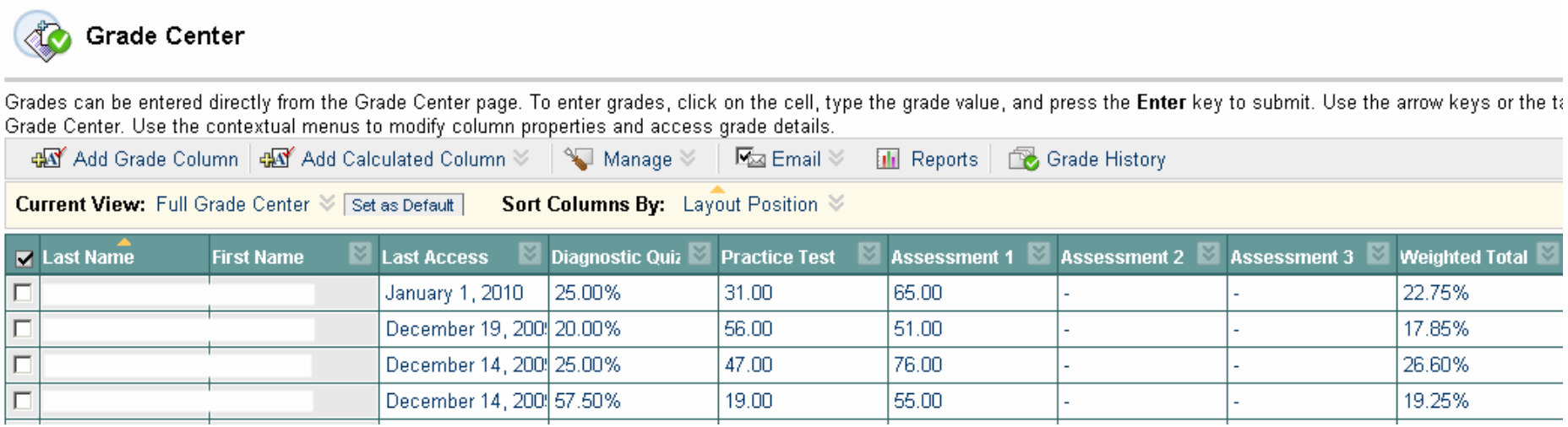
Grade Assessment Assessment 1 – Mathematical & Physics Principles; Mechanics & Statics (35%)

Name	Assessment 1 – Mathematical & Physics Principles; Mechanics & Statics (35%)
User	
Status	Completed
Score	76 out of 100 points
Time Elapsed	1 hours, 11 minutes, and 42 seconds out of 2 hours and 0 minutes allowed.
Instructions	You will be presented with a number of questions which you must solve in the provided answer booklet which is to be submitted. Enter all the answers in myBU **before** you submit your attempt for grading. The questions do not carry equal marks. There is only **one** possible correct answer for all multiple choice questions. Ensure all calculated answers are of an appropriate magnitude, are entered in the specified units and to 2 decimal places. You **may** use MDSolids to assist you in answering the questions where appropriate.
Clear Attempt	Click **Clear Attempt** to clear this user's attempt. Clear Attempt
Comments	Modify Feedback

ONLINE ASSESSMENT STRATEGY

Enables tracking of scores and the dates of attempts at each assessment.

Becomes clear which students have not engaged in the formative assessment strategy.



Grade Center

Grades can be entered directly from the Grade Center page. To enter grades, click on the cell, type the grade value, and press the **Enter** key to submit. Use the arrow keys or the ta
Grade Center. Use the contextual menus to modify column properties and access grade details.

Add Grade Column | Add Calculated Column | Manage | Email | Reports | Grade History

Current View: Full Grade Center | Set as Default | **Sort Columns By:** Layout Position

Last Name	First Name	Last Access	Diagnostic Quiz	Practice Test	Assessment 1	Assessment 2	Assessment 3	Weighted Total
		January 1, 2010	25.00%	31.00	65.00	-	-	22.75%
		December 19, 200	20.00%	56.00	51.00	-	-	17.85%
		December 14, 200	25.00%	47.00	76.00	-	-	26.60%
		December 14, 200	57.50%	19.00	55.00	-	-	19.25%

PRACTICAL LEARNING STRATEGY

The practical learning strategy is based on linking theory to practice to develop student knowledge by learning through enquiry.

Self-contained experiment workstations with hardware and online support for completing the experiments and storing the data through myBU have been developed.

Each experiment has been instrumented to capture key data from it (e.g. strain and displacement) through a bespoke computer application.

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PRACTICAL LEARNING STRATEGY

Students are provided with an interactive laboratory handout, which takes them through the experimental procedure and allows them to study the effect on the rig/component due to the application of load.

Students are required to validate these results using the theory they have covered in lectures.

The handouts have been generated to allow the students to explore the effect of changing parameters on the results therefore allowing them to learn through enquiry.

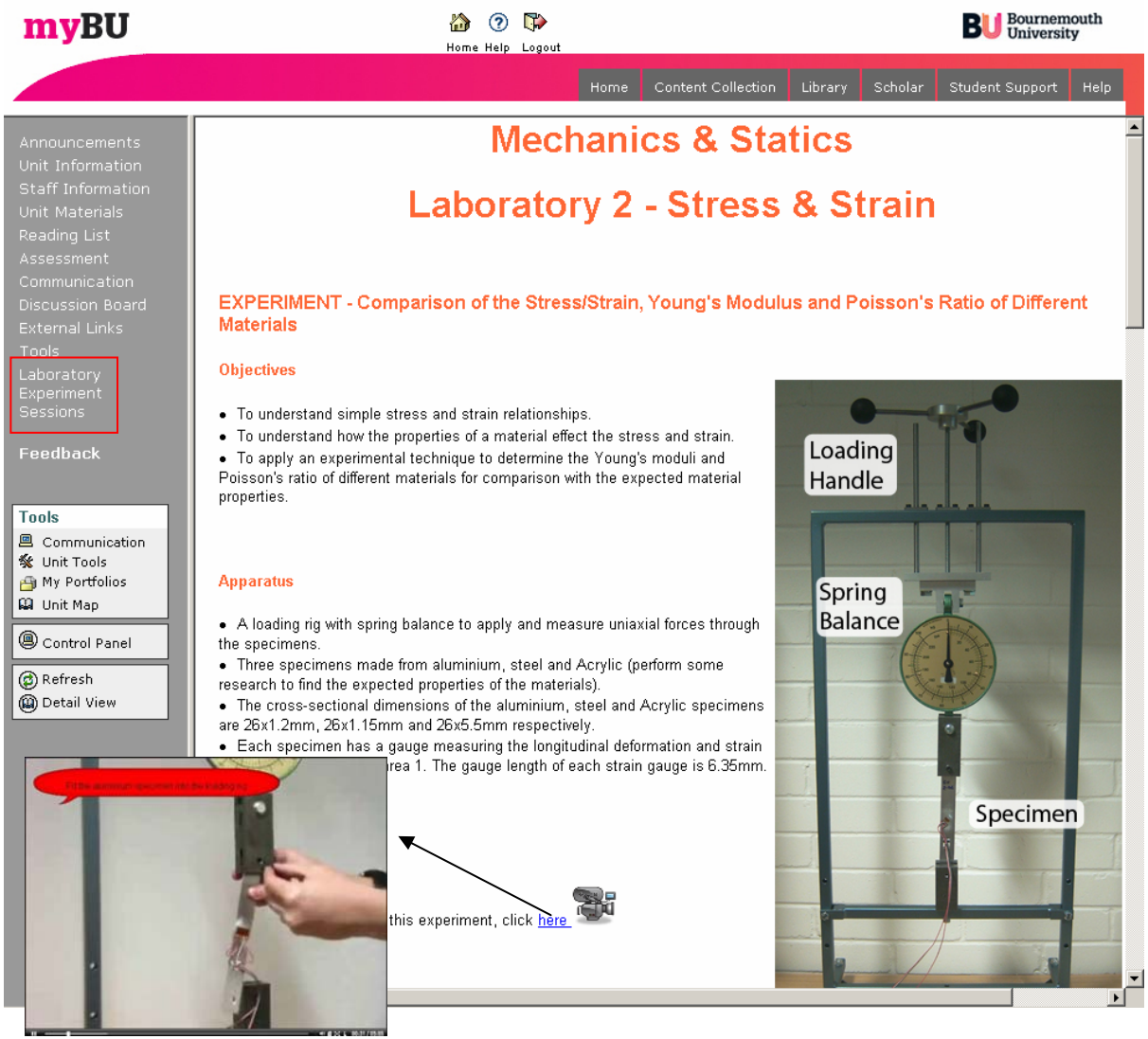
These developments aim to further motivate students to learn independently.

This has been achieved in collaboration with David Fevyer, Learning Technologist.

PRACTICAL LEARNING STRATEGY

myBU interactive handouts has:

- **procedure video clips**
- interactive laboratory sheets
- self assessment exercise
- links to relevant analysis tools



PRACTICAL LEARNING STRATEGY

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LOAD					
KG	N	DEFOR-MATION (mm)	LATERAL STRAIN (MICRO)	LONG STRAIN (MICRO)	POISSONS RATIO
10	98.1	0.4	-3	8	-0.375
20	196.2	0.6		0	
30	294.3				
40	392.4				
50	490.5				
				AVE	-0.375

Table 1: Experimental aluminium deformation and strain results.

Conclusion

How did the results of the experimental property results compare with the known properties of the materials (Tables 5 and 6)? What conclusions can be drawn from the different Young's Moduli and Poisson's ratios for the different materials (Tables 5 and 6)?

The results show...

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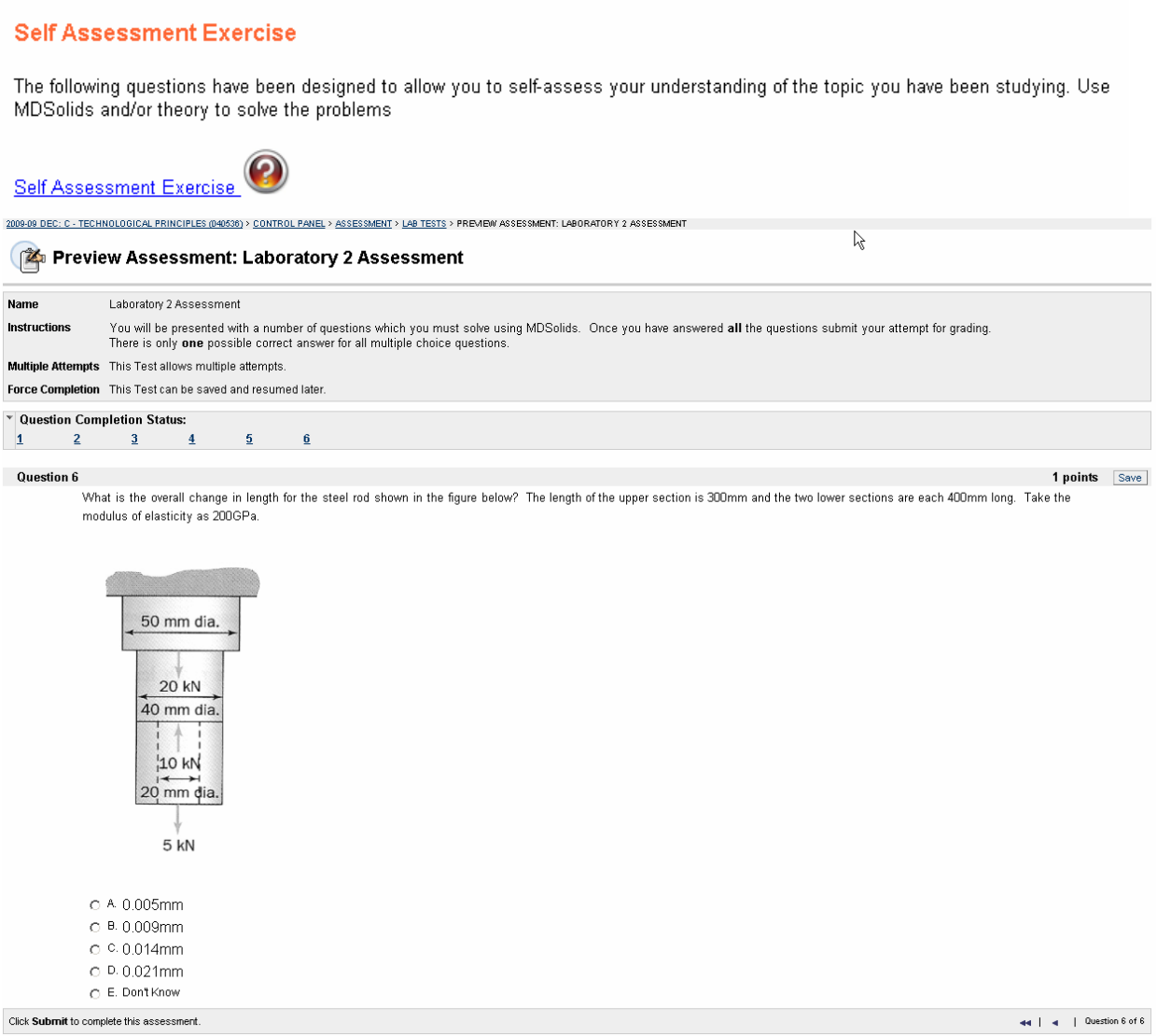

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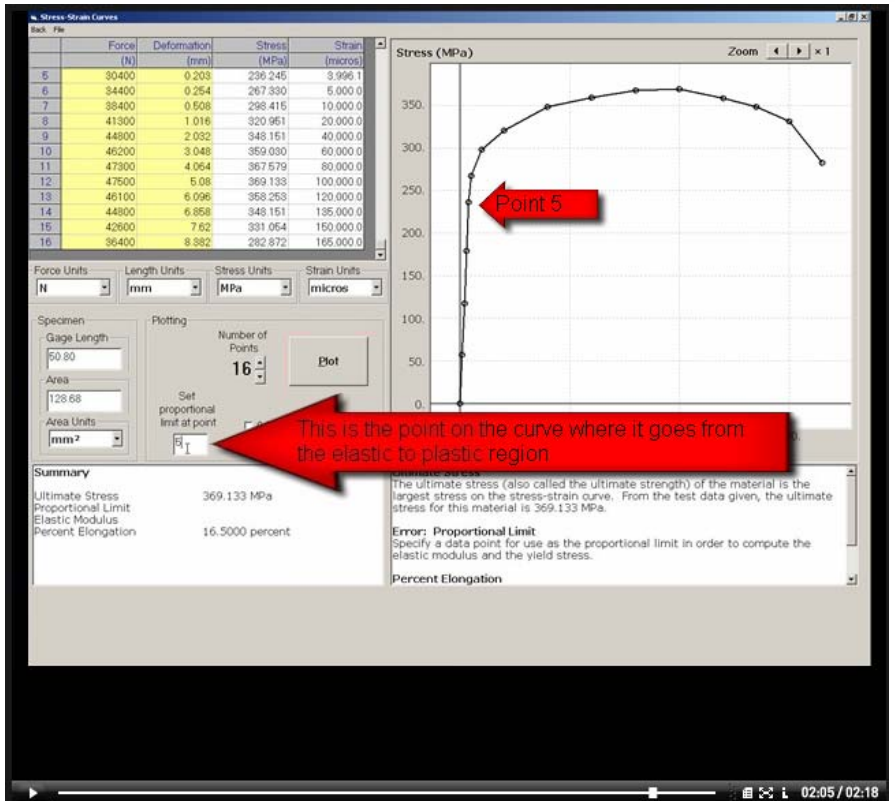
Analysis Tool - MDSolids 3.4

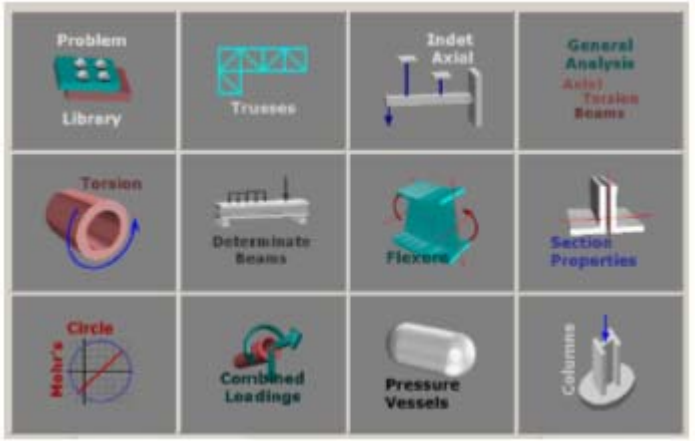
MDSolids has been provided for the general analysis of beams under uniaxial loading and for the determination of the elastic constants of the material for round and rectangular cross-section beams. The full MDSolids user guide can be found in the unit materials section. To view the user guide for this laboratory click here

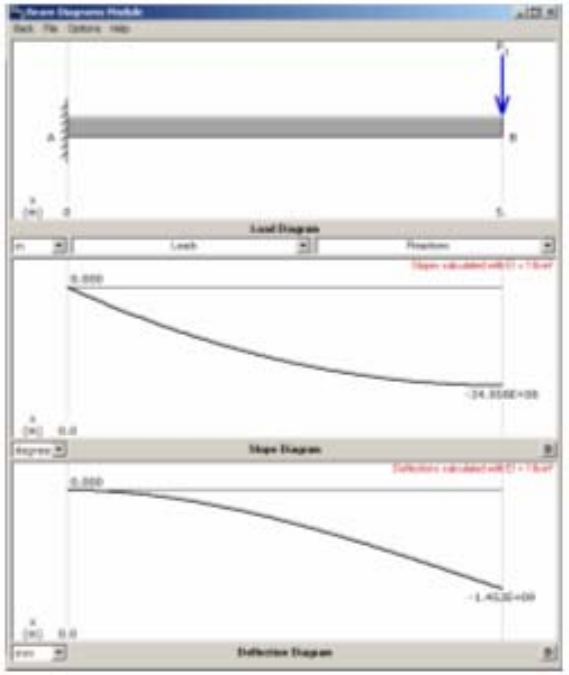


PRACTICAL LEARNING STRATEGY

MDSolids can confirm the results obtained by hand calculations and can be used to track down errors in the hand calculations.

In this instance MDSolids simulation results are used to further reinforce the accuracy of the experimental and hand calculation results.





PRACTICAL LEARNING STRATEGY

Once confidence is gained in the use of MDSolids it is also encouraged to be used in the revision process if the student is struggling to answer revision questions.

MDSolids also has a number of animated learning tools and games, which provides further revision, and learning support material.

STUDENT FEEDBACK

A questionnaire was given to all students enrolled on the unit through myBU to gather feedback on the strategies.

The questionnaire consisted of eight questions.

The responses were submitted anonymously.

STUDENT FEEDBACK

100% of respondents "**agreed**" or "**strongly agreed**" that the laboratory sessions were beneficial in their study of mechanics and statics.

96% of respondents "**agreed**" or "**strongly agreed**" that they would have benefited from laboratory sessions in the other topics studied in the unit (fluids, thermodynamics, etc.)

100% of respondents "**agreed**" or "**strongly agreed**" that the online worksheets were beneficial in developing their understanding of the concepts they covered.

36% of respondents felt the **online tests** were most beneficial in helping them understand the concepts covered.

36% of respondents felt the **ability to revisit worksheets at a later date** was most beneficial in helping them understand the concepts covered.

STUDENT FEEDBACK

96% of respondents "**agreed**" or "**strongly agreed**" that the practice online assessments aided their revision.

76% of respondents "**agreed**" or "**strongly agreed**" that they prefer online assessment to traditional paper-based assessments.

88% of respondents "**agreed**" or "**strongly agreed**" that the online assessment and practical learning strategy has helped them engage with the technology aspects of the course.

Other comments included:

"Very interesting, hope it continues into more detail, and more topics in year 2."

"Keep the worksheet and online test, its the easiest way to revise."

CONCLUSIONS

The strategy allows confidence to be gained in the theory they learn, learning through enquiry, regular assessment, instantaneous feedback and indicates progression and/or understanding of each topic.

A marked increase in performance (approximately 10% improvement in average mark) was seen with the introduced strategy.

In previous years an extra support session has been required to support the weaker students. This has not been required under this strategy.

Student satisfaction in the unit has increased.

The new strategy reduces contact hours (contact hours have reduced from 14 hours a week to 6 hours a week)

REFLECTIONS

A large amount of initial effort is required to set up assessments and labs over the summer.

A database of questions is being generated to make generating assessments quick and simple.

However, the marking burden has substantially reduced and there are less resits to mark.