

## A Survey of Student Attitudes to a Sequential Assessment Method in Engineering

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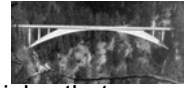
Thanks to the reviewers!

## Nature of Engineering Education

Civil & Environmental Engineering education covers a range of topics (basic science and mathematics, structures, hydraulics, geotechnics, management, numerical analysis, ...)

Underlying features include:

- learning the fundamental principles that govern the behaviour of engineering components and systems
- developing design and problem-solving skills.



## Open Ended Problems

Engineering design problems are typically open-ended with no single correct answer.

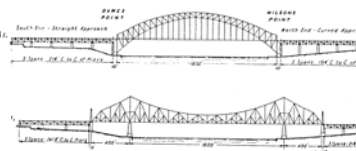
For example:

- design a system to 'water-proof' Adelaide
- design an efficient transport system for the CBD
- design an effective way of upgrading South Australia's major road and rail bridges

## Aims of Assessment

Assessment needs to :

- reward a superior approach to problem solving
- reward evidence of a deep level of understanding
- reward application of appropriate research
- concentrate more on the process and less on whether they have a standard solution sequence



## Role of Assessment

Assessment

- drives learning

Student perceptions of assessment are important:

- its strengths and weaknesses
- its relevance to the students

## Sequential Assessment

The aim of the assessment method is to:

- move away from set marks for set components (e.g. 20 for presentation, 10 for research, 50 for calculations, 20 for innovation)
- drive students towards solutions that show high levels of information synthesis, analysis, understanding, and innovation (as required for open ended problem solving)
- encourage the move to higher levels of learning (learn the fundamental principles → learn to learn → learn to think)

## Assessment Rubric

Learn the Fundamental Principles		Learn to Learn		Learn to Think	
minor grasp of problem or lack of understanding	acknowledgement of general requirements	application of requirements	determination of requirements to solve problem	depth of understanding	originality of thought
<i>Major errors or omissions common.</i>					
<i>Below Pass because of significant errors or omissions.</i>					
<i>Below Credit because of minor errors or omissions.</i>					
<i>Design according to the book but lacking reasons or giving shallow reasons (base line).</i>					
<i>Above Credit due to showing depth of understanding in tackling open ended aspect of design problem through deep reasons.</i>					
<i>Above Distinction because of signs of originality of thought in tackling open ended problem which has been explained through deep reasoning.</i>					
F (< 30)	P (30-49)	C (50-64)	D (65-74)	HD (75-84)	HD (85-100)
Final Grade					

## Study Focus

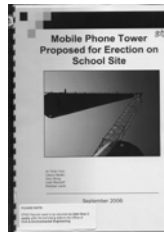
A number of key questions were to be addressed:

- do students understand the assessment method?
- do students accept the assessment method?
- if yes, then why?, if no, then why?
- is the method effective in driving solutions towards the goals of teaching open-ended problem solving?

## Courses in Study

Three courses, each with an important open-ended design component were selected for the study:

- Engineering Planning and Design (1st Year)
- Structural Design (2nd Year)
- Environmental Modelling, Management and Design (4th Year)



## Survey Questions

- I understand the sequential assessment procedure that is being used for the project / design component of this course.
  - 1=strongly disagree, 2 = disagree, 3 = mildly disagree, 4 = neutral, ... 7 = ...
  - I believe the sequential assessment procedure will give a fair representation of the work I do in the project.
  - I like the sequential assessment procedure, as I think it rewards good work.
  - I like the sequential assessment procedure because it gives me a clear indication of what to aim for in this project.
  - I would prefer a marking scheme that awarded certain marks for each component of the submission rather than this sequential assessment approach that looks at a broad range of aspects together.
  - I am happy that a new marking scheme has been developed for use in this course.
  - I believe that a well presented report that shows relatively poor problem solving skills should receive a similar mark to a poorly presented report that shows good problem solving skills.
  - The method of assessment will drive the way I work in this course.
- etc. (another 11 questions)

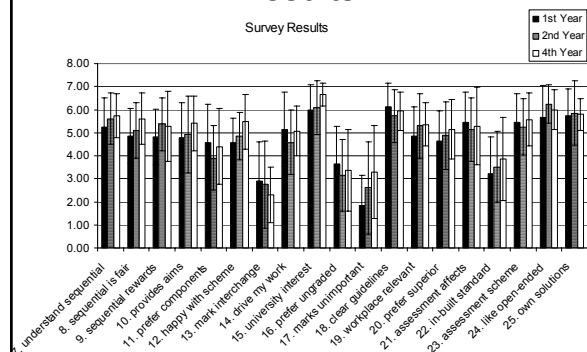
## Results<sup>1</sup>

Response rates:

- 1<sup>st</sup> year: 88 in a class of 280 (31%)
- 2<sup>nd</sup> year: 33 out of 76 (43%)
- 4<sup>th</sup> year: 15 out of 26 (57%)

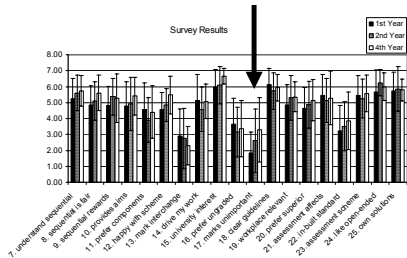
The gradually increasing rate of involvement in the survey reflects the increasing maturity of the students.

## Results<sup>2</sup>



### Results<sup>3</sup>

The students read the questions carefully (e.g. low result for Q17 (marks are unimportant ...))



### Results<sup>4</sup>

General acceptance about a number of issues. Students:

- understand the assessment method (Q7)
- appreciate why it is being used (Q9, Q10)
- see the design and project problems as relevant to their careers (Q24)
- believe the assessment reflects professional practice (Q19).

### Results<sup>5</sup>

There is also general agreement on:

- the need for open-ended problems (Q25)
- the fact that assessment drives their work (Q21)

Most students would not like to see ungraded passes as an option (Q16)

The marks they get are important to them (Q17)

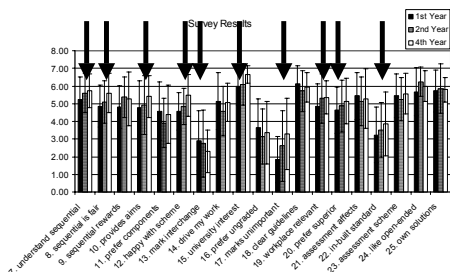
### Results<sup>6</sup>

Students take assessment seriously and readily admit that it affects the way they work through the semester (Q17, Q23).

Students see that there is something wrong if marks for presentation can make up for an inadequacy in the content of the report or design (Q13).

### Results<sup>7</sup>

There is evidence of a trend based on maturity on nine of the questions (Q 7, 8, 10, 12, 13, 15, 17, 19, 20, 22).



### Results<sup>8</sup>

There is evidence of an increasing level of focus on the marks themselves, and acknowledgement that the lecturers are the ones that should be setting the assessment criteria (Q12, Q20).

## Conclusions

- Students understand the assessment scheme and trust it, leading to an element of risk-taking in their designs where experimentation is encouraged and rewarded
- Student perception that deeper learning outcomes had been achieved is also reflected in a score of 6.4 out of maximum of 7.0 in response to the statement 'This course helps me develop my thinking skills (e.g. problem solving, analysis) as part of the SELT for Environmental Modelling, Management and Design course in 2006, with 100% broad student agreement