

**REFLECTIONS ON TRIALLING TWO TEACHING STRATEGIES FOR
SUSTAINABILITY MANAGEMENT EDUCATION IN AN UNDERGRADUATE
ENGINEERING MODULE**

by

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Introduction

This paper focuses on the effects of trialling two teaching strategies for sustainability management education in an undergraduate engineering module.

Sustainability

What is sustainability?

Sustainability means different things to different people.

For me, sustainability is.....

Taking Action For Our Future



Teaching Sustainability

- School of the Built Environment
- Work Practices & Management module (UUJ)
- Learning style of student...
- ❖ Trial two Teaching Methods
 1. Use of acronyms
 2. The Consultancy

1. Use of acronyms

Question posed at the beginning of the lecture...

“How can construction management influence the direction and focus of sustainability?”

TEAM EFFORT

Construction management can have a positive influence on the direction of sustainability by using what I call the 'team effort formula':

$$\mathbf{TE = AM + EF + FO + RT}$$

Where:

TE = Team Effort

AM = Appropriate Management

EF = Evaluation Framework

FO = Focused Outlook

RT = Risk Translation

Appropriate Management

$$TE = AM + EF + FO + RT$$

Educational base and training

- Educated personnel in:
 - Environmental management
 - Health, Safety and Welfare (H,S&W)
 - Sustainability best practice
 - New construction techniques
- Professional qualification & professional membership (IEI, CIBSE, ICE & CIAT)

To embrace problem solving as part of the learning curve

- Ask for help (if needed)
- Learn from mistakes – be honest
- Learn to coordinate!
- Know about legislation and contract law

Measure performance and make decisions

- Management systems and audits for:
 - Environmental & waste management
 - Health, safety & welfare

Ability to motivate self and others

- Enjoy the fact that you can make a difference by positive action
- Be aware of sustainability issues in order to make better informed choices

Build teams within and outside the organisation

- Use group norms to your advantage!!

Evaluation Framework

$$TE = AM + EF + FO + RT$$

Procurement Method

- What option is the best in the long-term?
- Has the process a credible appointment system that is weighted appropriately?
- Whole-Life Costing (WLC)

Comprehensive contract documents that consider the long term

- Client's requirement shown in a transparent method in the documents
- Weighted tenders based on price, quality, environment/sustainability and safety
- Adequate supervision and records

Health & Safety

- Design risk registers (CDM)
- Persons responsible
- Competency through training, experience and knowledge

Quality control & quality assurance

- Specific checklists with feedback loops
- ISO 9001, ISO 14001 and OHSAS 18001
- BREEAM/CEEQUAL
- CoP for Project Management (CIOB)

Waste management and designing for sustainability

- More thought at tender stage can reduce waste, look at embodied energy
- Waste minimisation strategy

Focused Outlook

$$TE = AM + EF + FO + RT$$

Continuing professional development (CPD)

- Current environmental legislation
- Sustainability Best Practice
- New Technology and Techniques
- Project Management – Best Practice

Learn to improve the future by looking at the past

- Early contractor involvement
- Case studies of failures and successes to equip students with this information
- Improve existing control measures by identifying weaknesses, record, implement and re-check

Academic research

- Flood risk evaluation and control
- Risk assessment in environmental issues
- Value engineering & WLC
- Sustainable construction
- Public Health Engineering

Career growth, through Professional Body Membership

- Professional Institutes, such as IEI providing CPD, a substantial construction data base, business contacts, mentoring and action that delivers

Risk Translation

$$TE = AM + EF + FO + RT$$

What risks are involved?

- Environmental Impact
- Health, safety and welfare
- Unforeseen circumstances
- Insufficient contractual information
- Interference with existing infrastructure
- Trespass, weather, war and many more...

How is the risk shared?

- Allocated in the contract documents
- Careful consideration is required in order to maintain both good business and moral values.

Proper programming to reduce the risks

- Programme should show:
 - Realistic time for each operation including consideration of environmental and health and safety issues

Define clearly who is responsible for what and when

- Contacting service providers
- Implementation of recommendations
- Submission and approval of designs or method statements that consider sustainability
- Taking necessary action to eliminate or reduce particular types of risk

TEAM EFFORT Student Survey

- ❖ In a student survey, the following observations were made directly after the TEAM EFFORT lecture:

Table 1: Recollection Observations

Q.	Question Description	Correct Answer (%)
1	What does TE stand for in the formula?	100
2	What does AM stand for in the formula?	76
3	What does EF stand for in the formula?	82
4	What does FO stand for in the formula?	62
5	What does RT stand for in the formula?	100

TEAM EFFORT Student Class Test

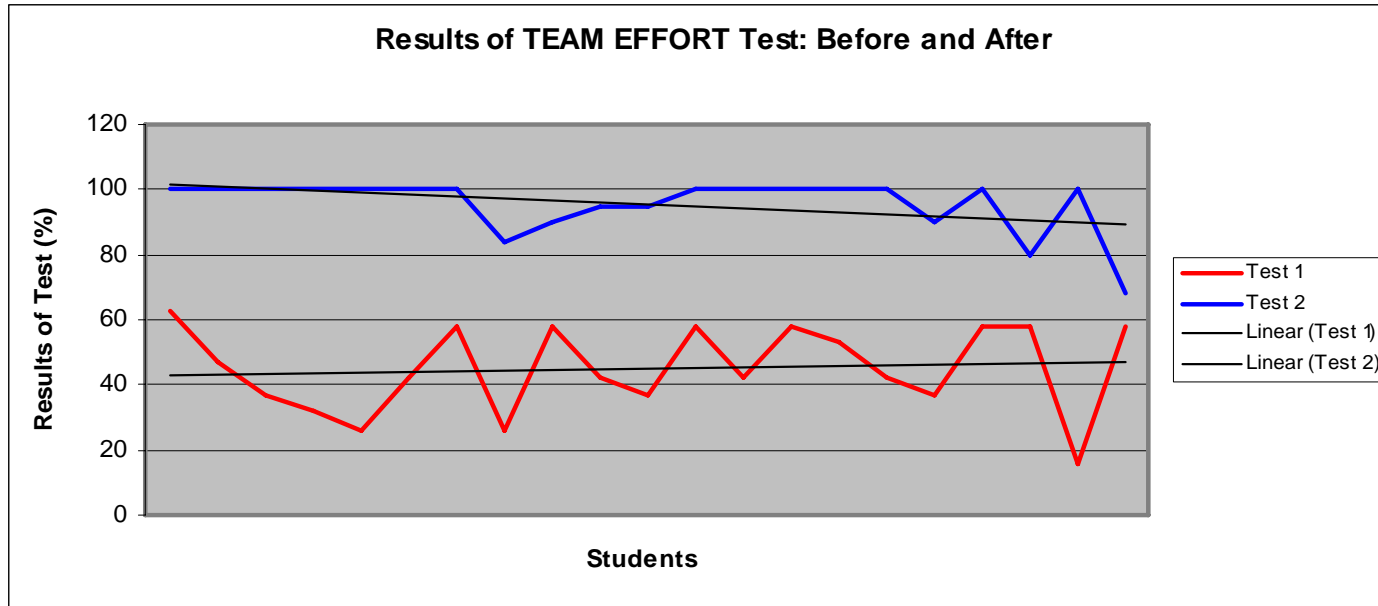
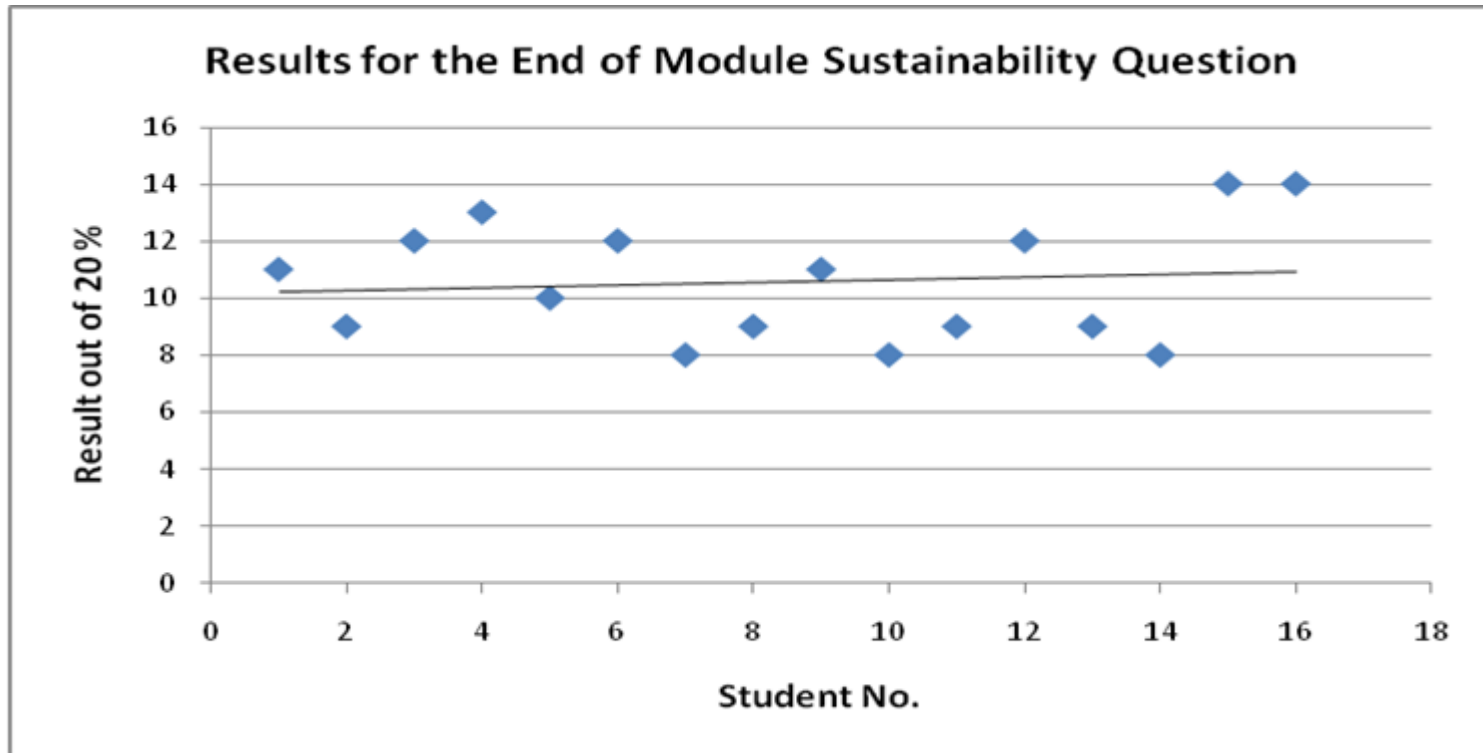


Table 2: Class Test

	Student knowledge – before Lecture	Student knowledge – after Lecture
Average	45.1%	95.3%
Standard Deviation	13.3	8.6

TEAM EFFORT Student Exam Result for the sustainability question



- Students only managed to achieve approximately half the available marks.
- Although they effectively recalled the theory on team work, their answers did not necessarily link the TEAM EFFORT formula to sustainability.

TEAM EFFORT Negatives

- ❖ It is difficult to come up with an acronym or formula for every lecture
- ❖ Would we want an acronym or formula for every lecture? – No!!!

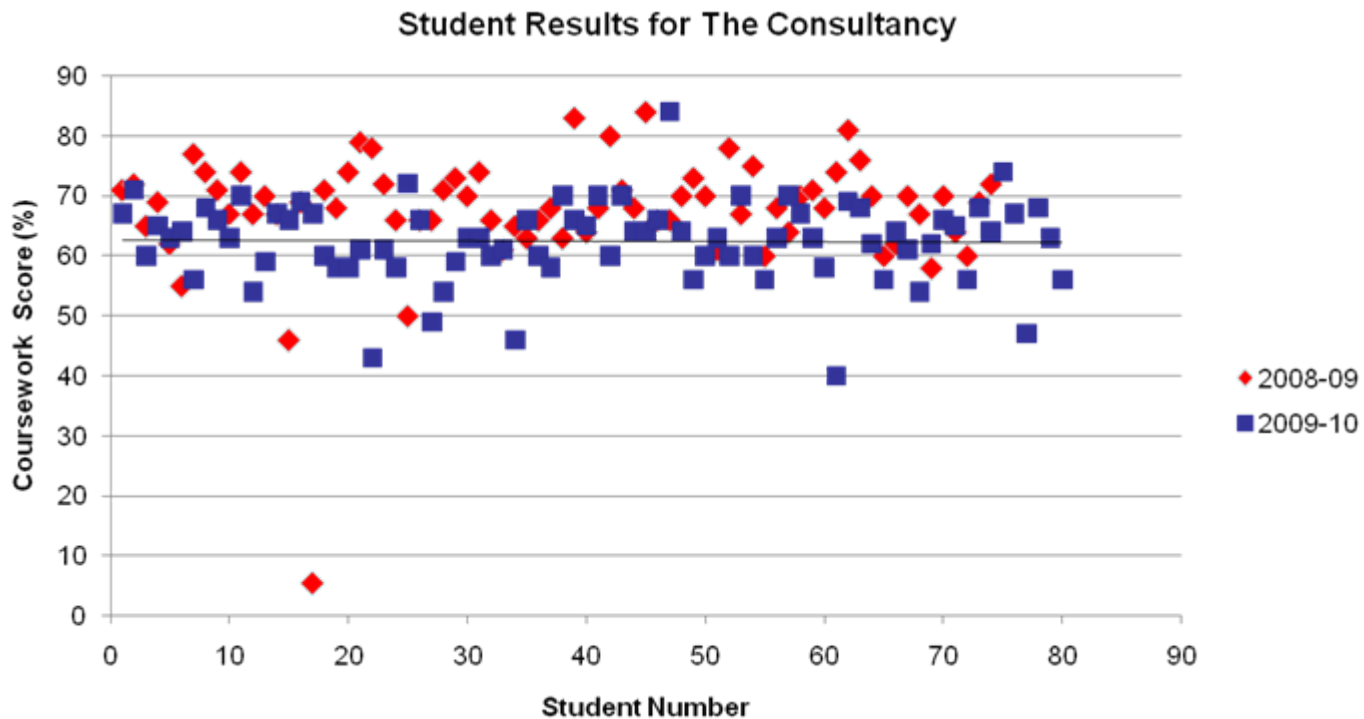
2. The Consultancy

- The Consultancy is a management simulation.
- Class split into groups of eight students.
- The 2009-10 Consultancy looked at sustainability in construction as opposed to a complete focus on tendering/cash flow used previously.

Group work & Individual Report

- 5-week period, the groups were given tasks to solve by choosing from three available solutions.
- Individual report by each student based on their experiences within the management simulation.
- Results from the report were lower in 2009-10 compared with the previous year.

Results from the Consultancy Assignment



Average individual assignment results for “The Consultancy” dropped from 67.7% (± 9.91) in 2008-09 to 62.38% (± 6.80) in 2009-10.

Conclusions

- ❖ The use of acronyms in helping students to recall specific lectures has a positive impact.
- ❖ The “Consultancy” helped student understand in the need for a multi-disciplinary approach to achieving sustainable development.
- ❖ More work required to establish trends in the module results.

Questions?

Thank You!