

Educating Engineers as if they were Human: PBL in Civil Engineering at the University of Limerick.



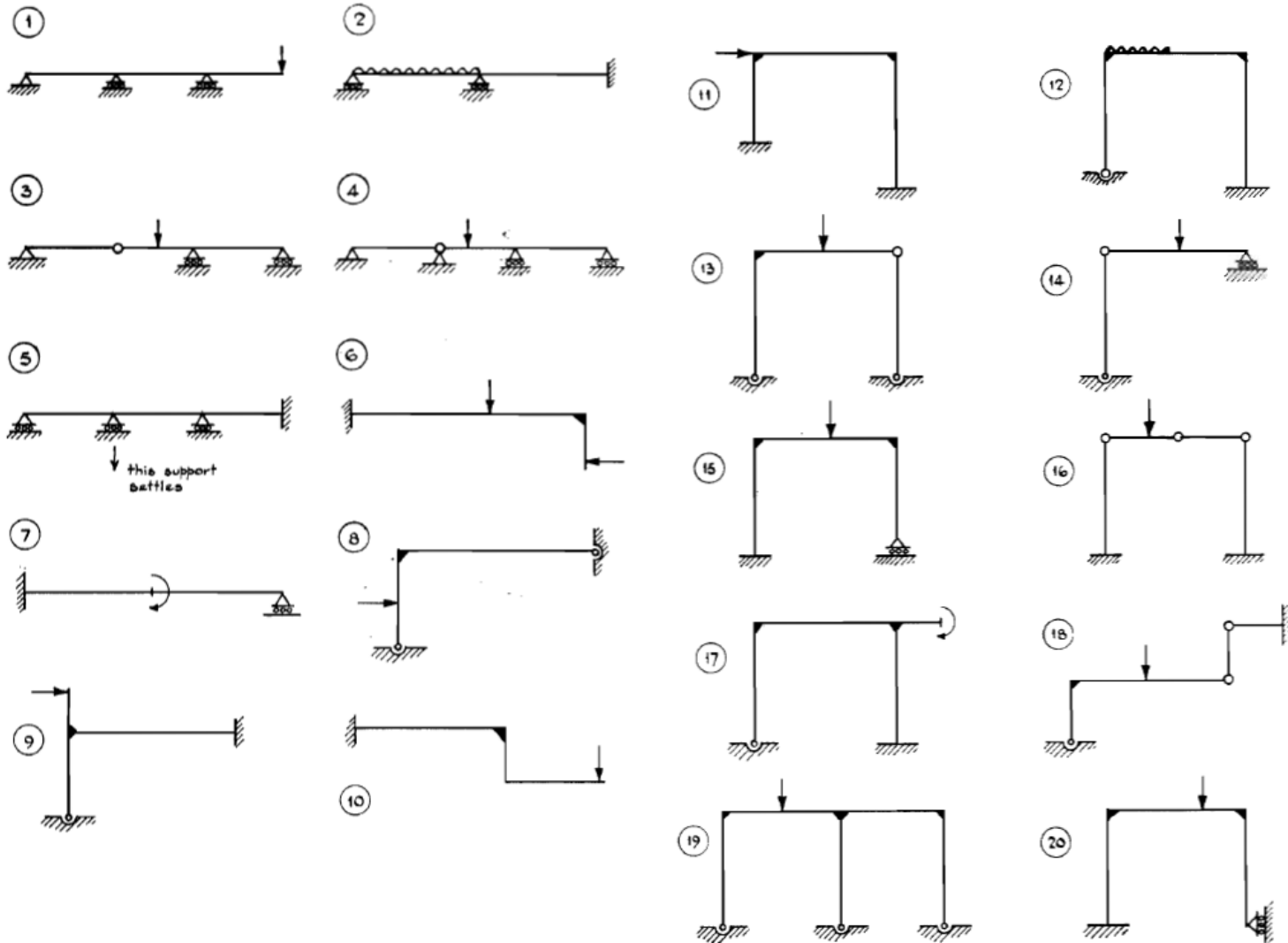


Fig 2. Revised test paper



”Good honours graduates could not anticipate, even approximately, the shape of the [bending moment] diagram they were expecting to produce”

Cowan (1998) citing Brohn (1973)



- **My Undergraduate Career:**
 - Emphasis on didactic teaching
 - Rote learning, particularly in early years
 - ‘Disconnect’ between Pre-Clinical Teaching & Clinical Training
 - Much learning in early years proved irrelevant and was quickly forgotten

Prof. Finucane UL GEMS (2009)



*”They lack basic skills:
thinking it out for
themselves, designing,
writing, drawing, sketching,
presenting, calculating,
validating. They have
assimilated a lot of
knowledge but do not know
how to use it effectively.”*

May (2009)





Educating Engineers as if they were Human

*“ Heuston,
we have a problem “*

attrib. to James Lovell (April 14, 1970)



What might a student centred response to these kinds of issues look like?



*“many of the sketched solutions
which
he would have discarded as
contemptible had been the
result
of one small slip in an otherwise
sound process of logical
thinking.”*

Brohn & Cowan (1977)



*Didactic instruction is an
ineffective and
inappropriate way of
developing
cognitive abilities*

Cowan (1998)



If we desire...to form individuals capable of inventive thought and of helping the society of tomorrow to achieve progress, then it is clear that an education which is an active discovery of reality is superior to one that consists merely in providing the young with ready-made truths.

Jean Piaget (1896-1980)



“My ..design of learning and teaching situations relied heavily on a reflective approach to process and was measurably effective.”

Cowan(1998)



Therefore CIVIL @ UL is concerned with:

- personal responsibility for learning
- a research orientation
- reflective practice
- group working
- communication and presentation skills



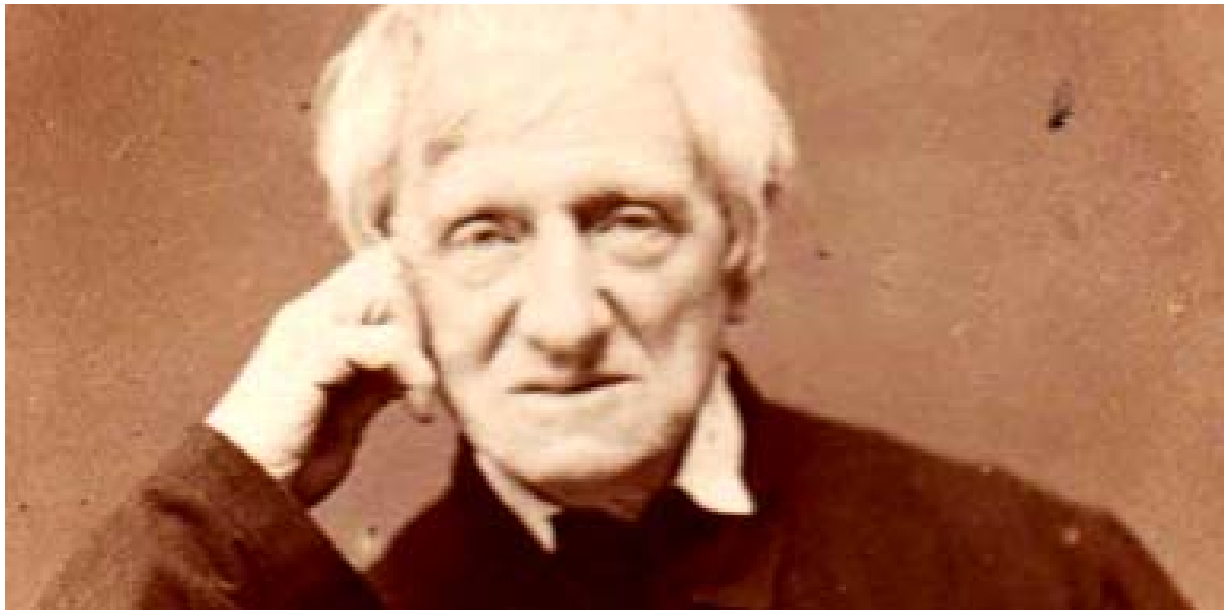
- We are in the behaviour change business
- We are concerned with the development of appropriate attitudes and habits of mind



Effective Teaching:

- Activity (as distinct from passive listening).
- A variety of modes of engagement (visual/verbal, active/reflective etc)
- A task or challenge (i.e. a reason or motivation to seek knowledge)
- A connection with personal experience (a concrete application)
- Use of historical precedent as a context (see Phillips, 2009)
- An opportunity for individual self expression.
- Social contact (group activities)
- A teacher who inspires respect.





The general principles of any study you may learn by books at home; but the detail, the colour, the tone, the air, the life which makes it live in us, you must catch all these from those in whom it lives already.

The Socratic Method

- The Socratic method encourages participants to reflect and think independently and critically.
- Socratic Dialogue is practiced in small groups with the help of a facilitator, so that self-confidence in one's own thinking is enhanced and the search for truth in answer to a particular question is undertaken in common.



Problem

Research

- Experience/Experiment
- Data/Facts

Reflect

- Concept
- Analysis
- Dialogue

Create

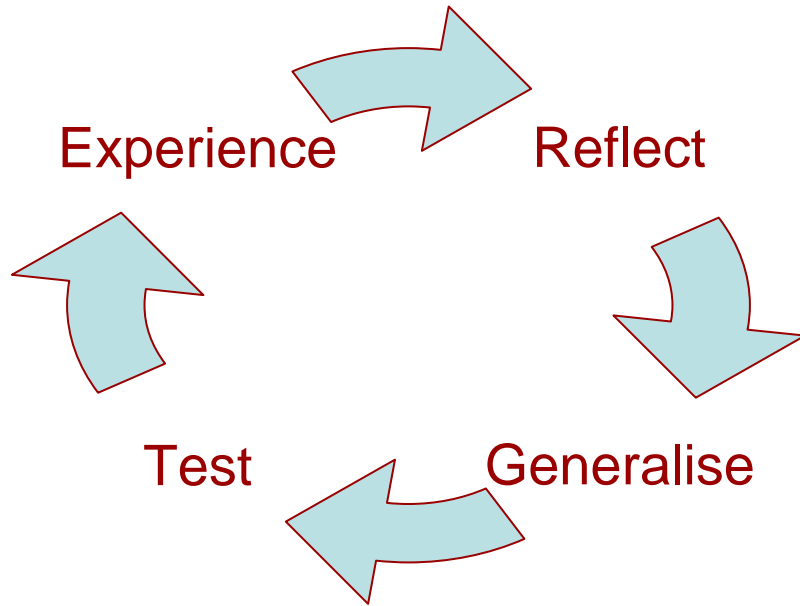
- Synthesis
- Insight
- Evaluation

Solution

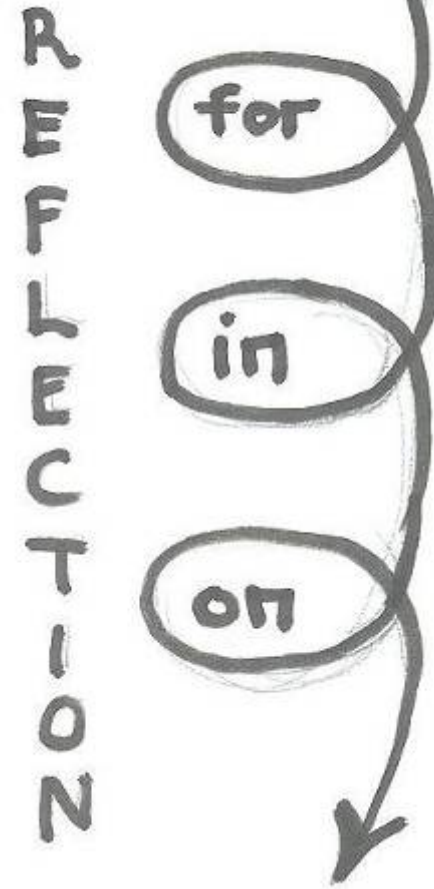
Bloom / Levels of thinking

- Remember
- Understand
- Apply
- Analyse
- Evaluate
- Create





The Kolb Learning Cycle

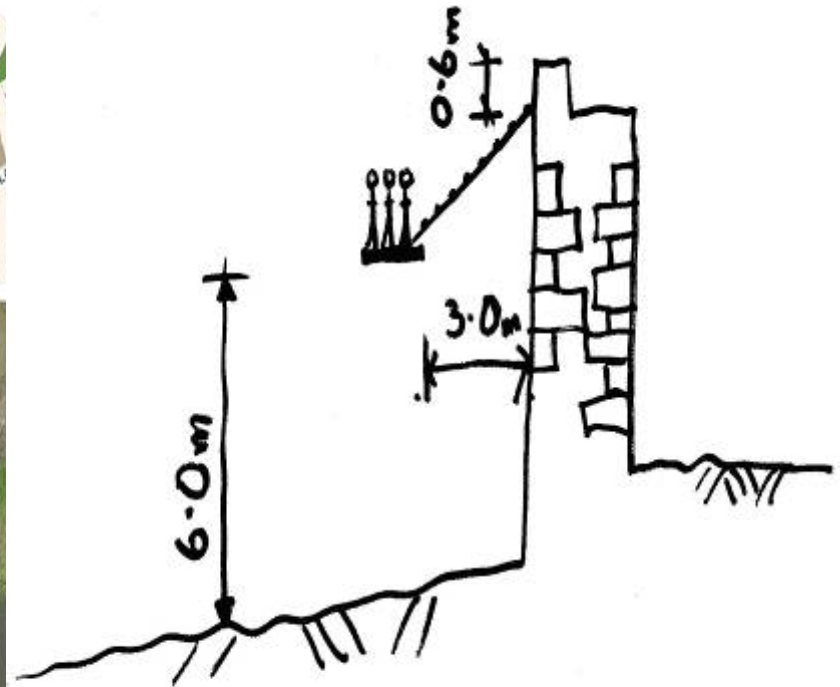


Cowen Diagram

- Appoint Scribe
- Brief/problem presentation.
- Clarify unknown terms and request essential missing information.
- Brainstorm existing group knowledge and solutions
- Organise knowledge
- Propose a tentative solution
- Identify knowledge gaps
- Make Research Plan
- Scribe reads Research Plan for transcription by group.
- Adjourn



Timber & Steel Design
Semester 3
Trigger 1 Timber Design.
Siege of Limerick



Schematic of Siege Platform

Design and construct a siege staging platform to support 4 persons to besiege Kir John's Castle in Limerick City.



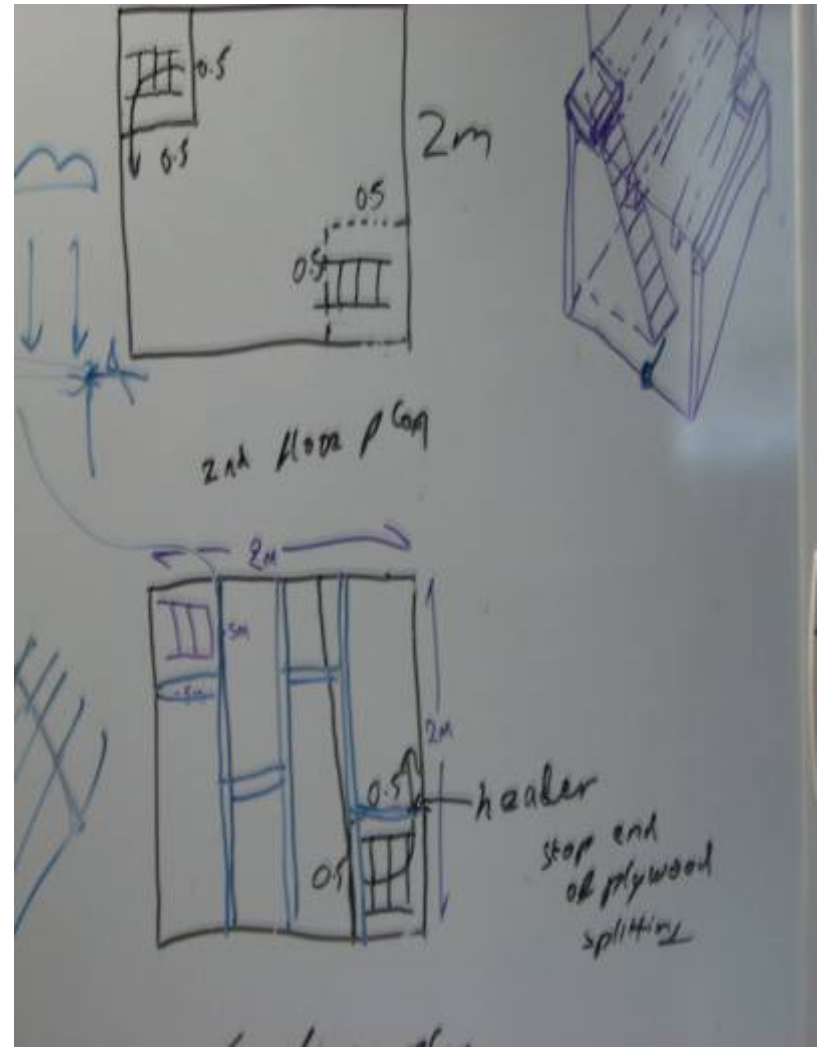
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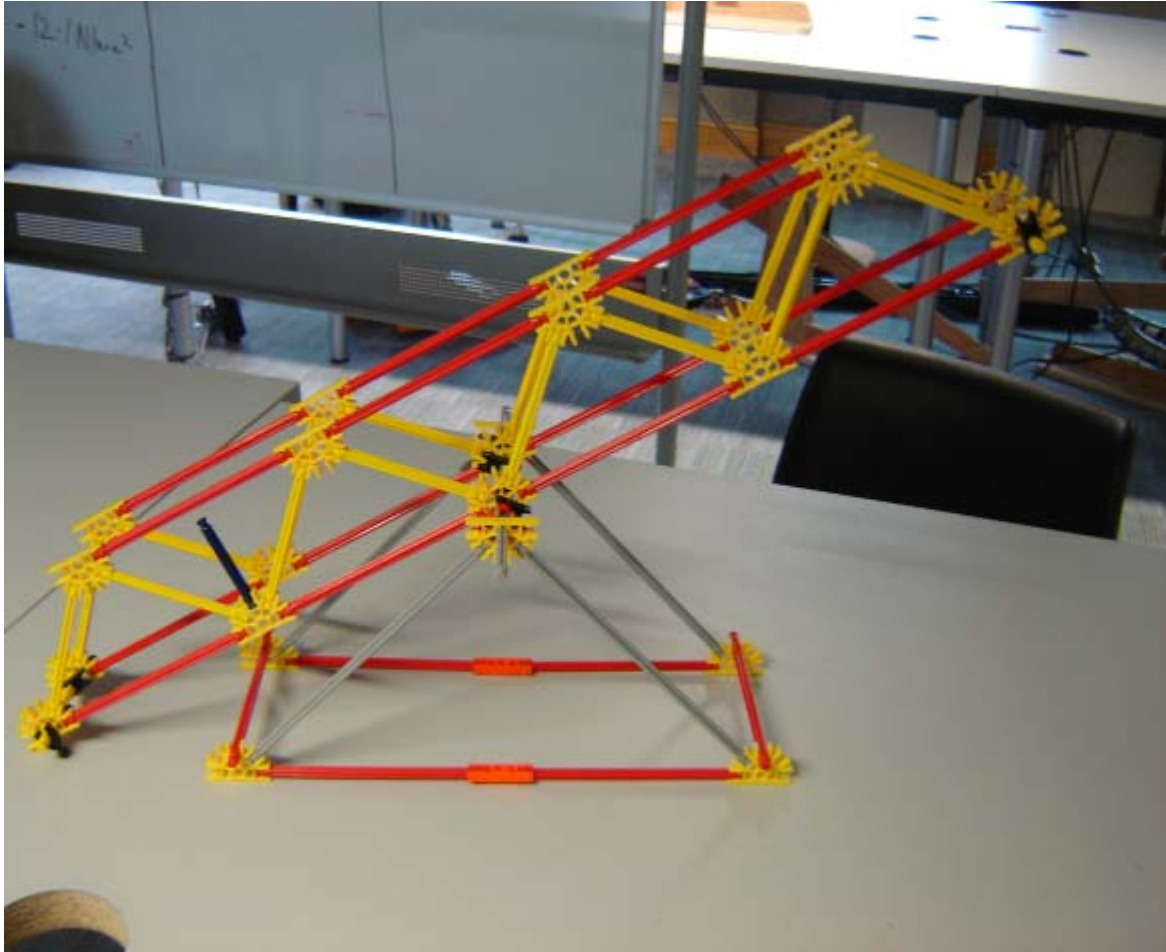
• They are so much easier to comprehend now
considering + I have become quite competent.

• Brainstorming & Mistakes made ~

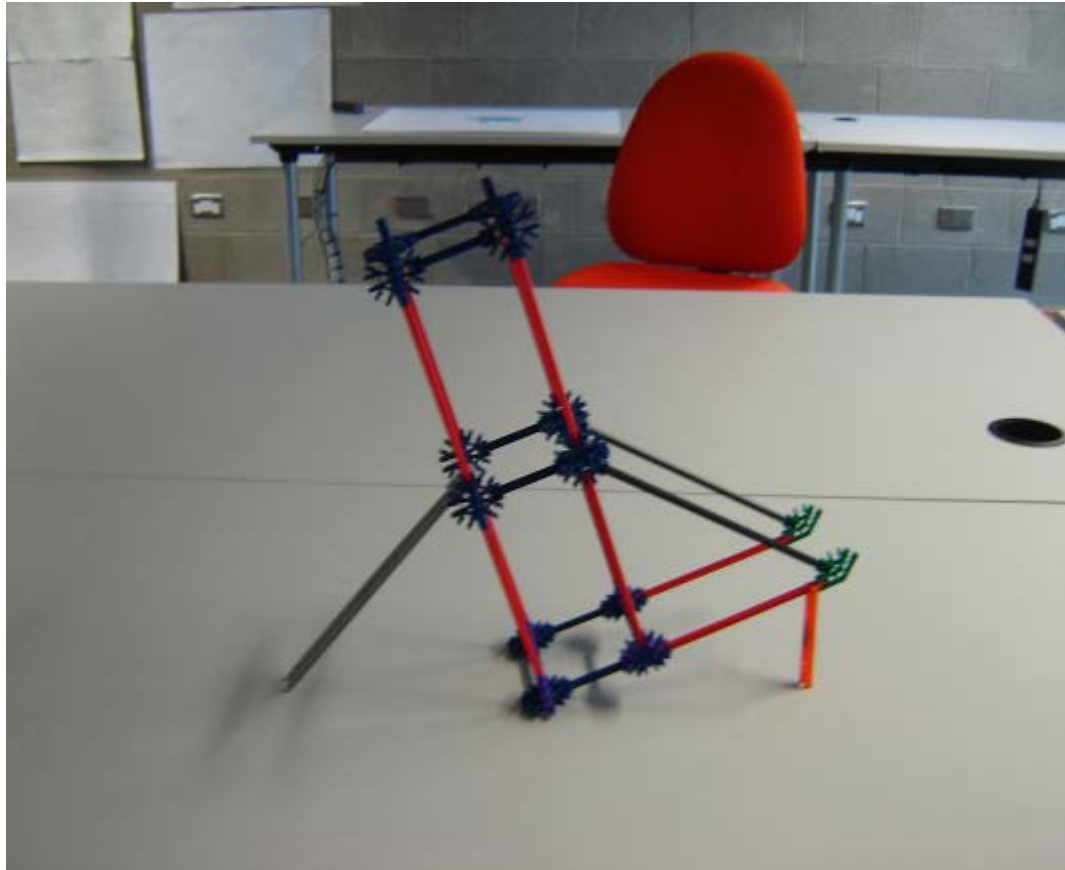
In Brainstorming ~ Can be painful at times
but if enthusiasm is put in by 1 or 2
group members then it can be excellent.

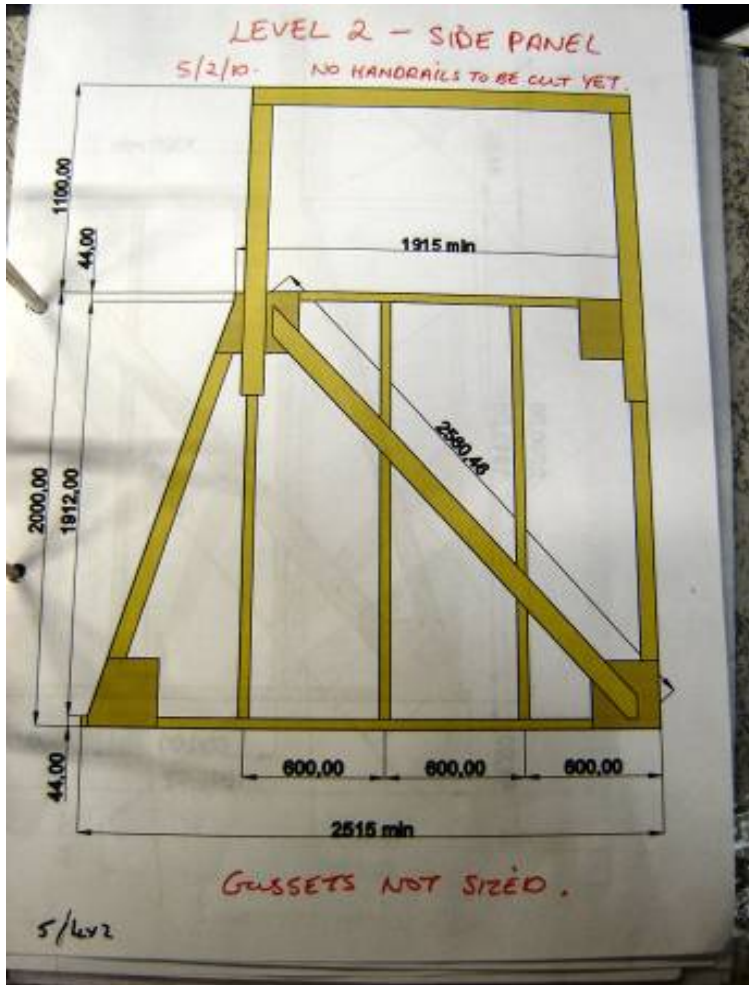
• People still refuse to talk or put an opinion in
in class. So many times a question is asked
and someone will say the answer under ~~breath~~
breath. The class "I think" is being let go
state at times because $\frac{3}{4}$ of the people there
went ever give an opinion

Giant See-Saw



Tilt up tower









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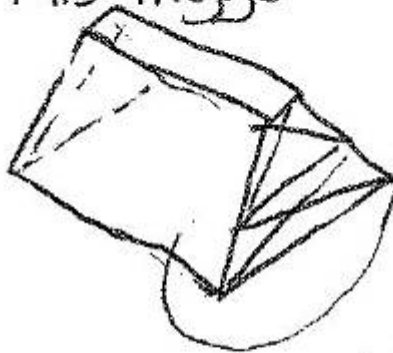


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• Was asked on the 1st day of
this trigger

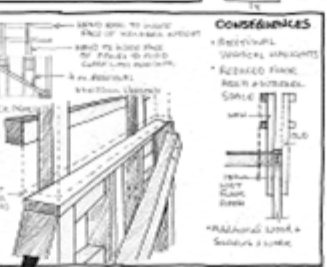
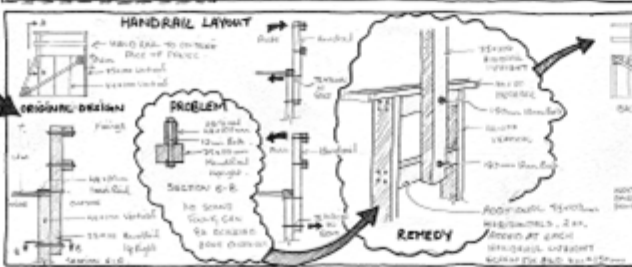
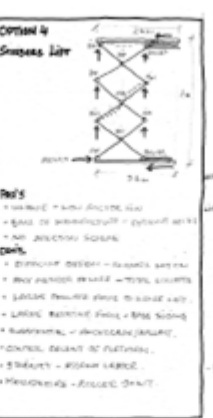
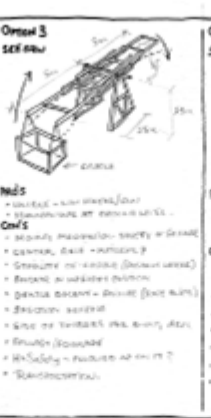
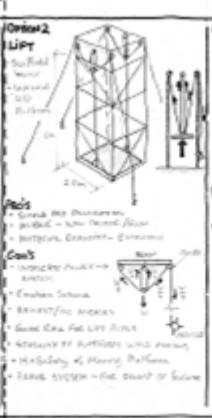
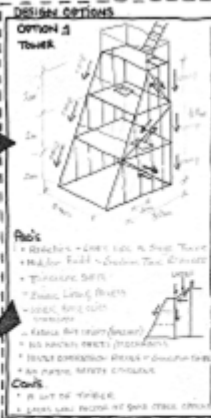
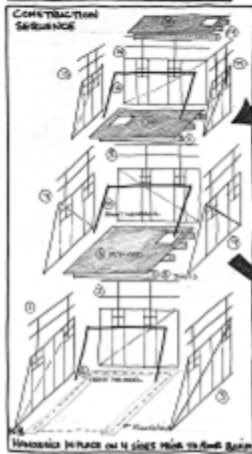
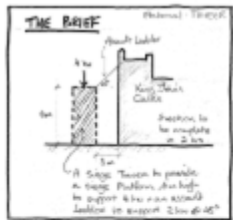


• What does it matter
in this particular case
if there is no immediate
restraint in the tower?

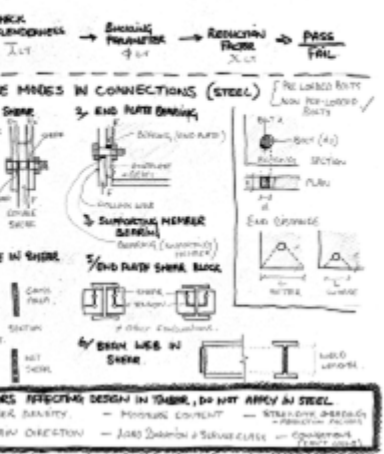
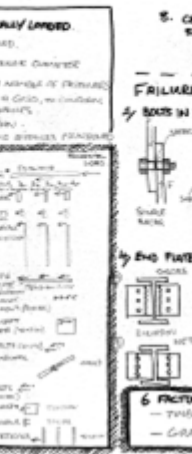
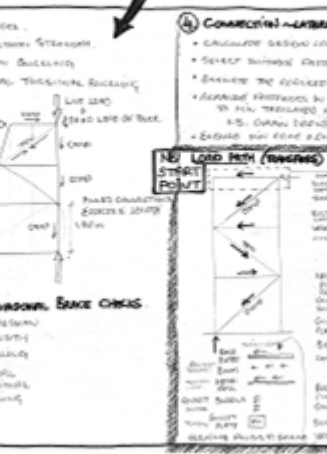
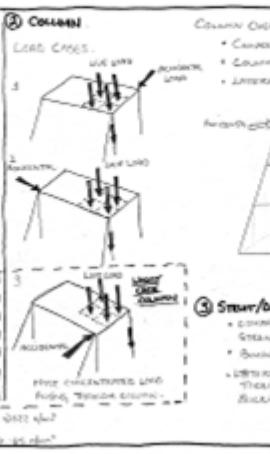
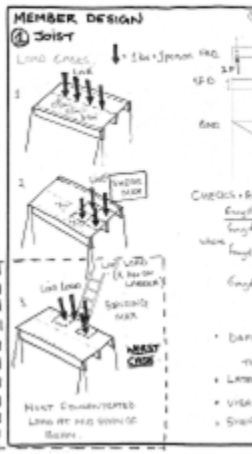
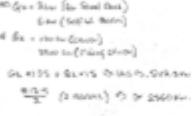
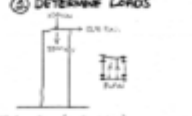
COULDN'T ANSWER

• 4 weeks later the same question is
asked and after analysing FBIDs
+ moment equilibrium it clicks!!! ↷





ANALYSIS & DESIGN FACTORS FOR STEEL PLATFORM BEAM



- This has made me see that as Engineer's we need to maybe slow down, stop racing into the calc's, spend a little more time weighing up the various scenarios.
- The enthusiasm of one or two in a team can push things on too fast before all the angles of the current issue are exhausted.



Not enough feed back on work handed up, on an individual basis.

Very time consuming module, eats into time required for other Modules

The lecturer perhaps doesn't realise how long the assigned work actually takes a student to do.

Very good approach to learning & developing skills in a student. The student learns a lot from it



- I realised the meaning of a concept from my old physics classes: perpendicular forces do not interact.
- The desire to avoid conflict in the group led to poor decision making.



- SIMILARLY I FOUND THE LECTURES INTERESTING. HAVING GUIDANCE AS OPPOSED TO BEING COMPLETELY ON OUR OWN WAS BENEFICIAL AND WORTHWHILE I WOULD SAY.

- FINALLY I WOULD HAVE TO SAY THAT DESIGNING A PROJECT FROM BEGINNING TO END WAS PROBABLY ONE OF THE MOST DIFFICULT TASKS I HAVE ENGAGED IN SO FAR. ALTHOUGH THE BRIDGE PROJECT IN FIRST YEAR WAS PIVOTAL IN OUR COURSE, I FEEL THIS SIEGE TOWER WAS EVEN MORE OF A MILESTONE. THE CHALLENGE OF IT WAS VERY TOUGH BUT I FEEL IT IS SOMETHING MANY OF US WILL TAKE TO THE GRAVE WITH US.





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