Flipped classroom learning in a large introductory undergraduate engineering course

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Despite all these purported advantages arising from blended teaching methods, the relation between usage of the blended learning environment and student's performance is not clearly understood. (Birch & Williams, H.E.R., 2015)

- This is the concluding report
- 2 x 2^{+}-year TLRI-funded programs
- Surprising & unsurprising observations

Why do this study? What's new?

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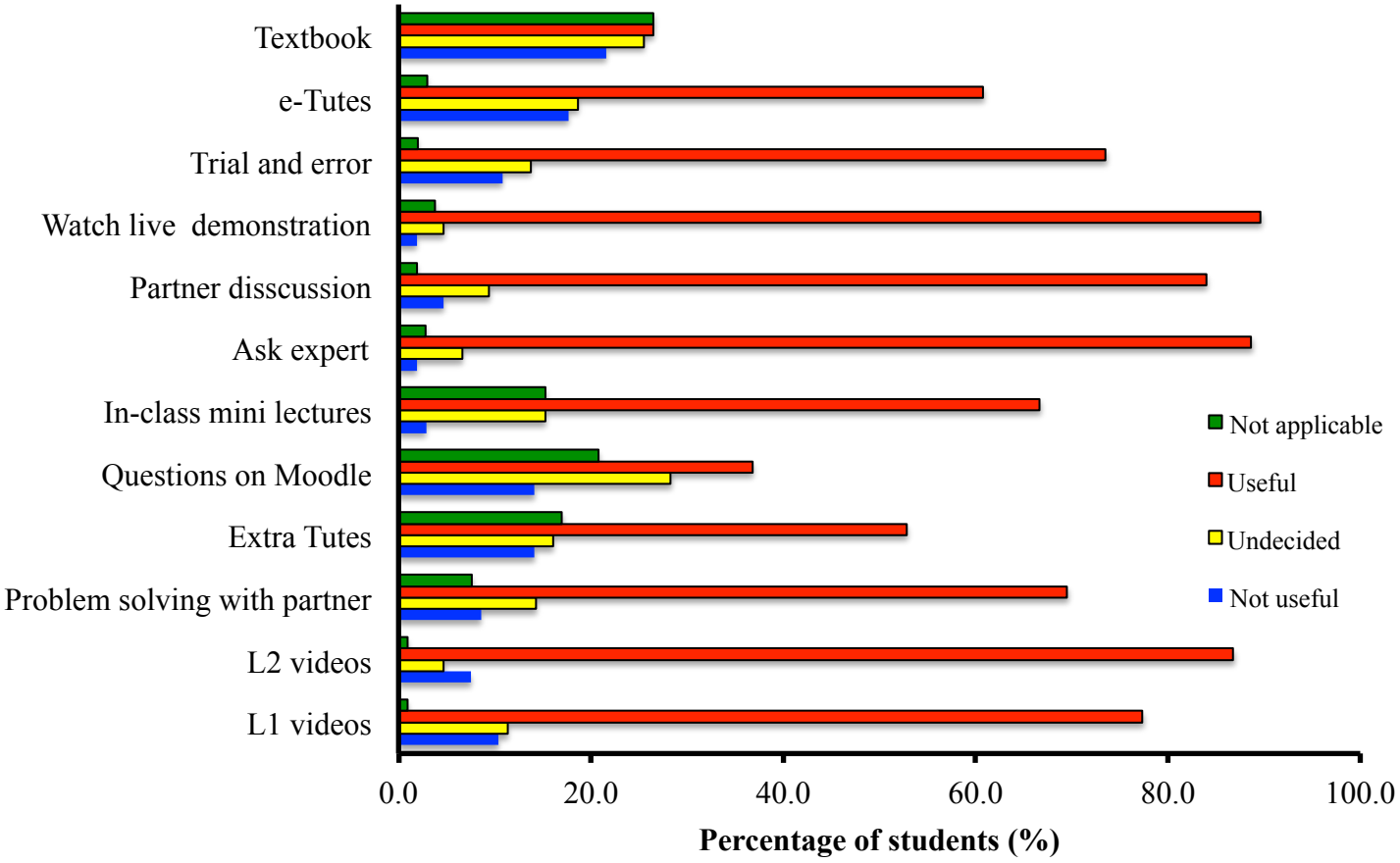
- Intensely-benchmarked large [electronics] class
- Strong Threshold-Concept (TC) emphasis

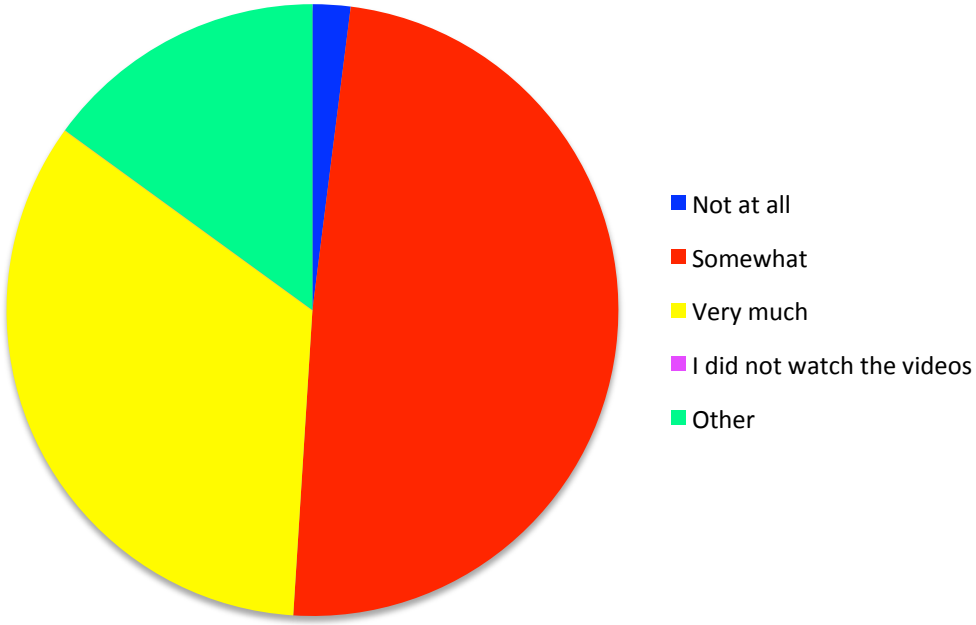
For same contact-hours (read "effort" or "cost"), does flipping give better learning in large, multi-lab-stream, class?

(Turns out it is all about the labs)

Quantitative Outcomes

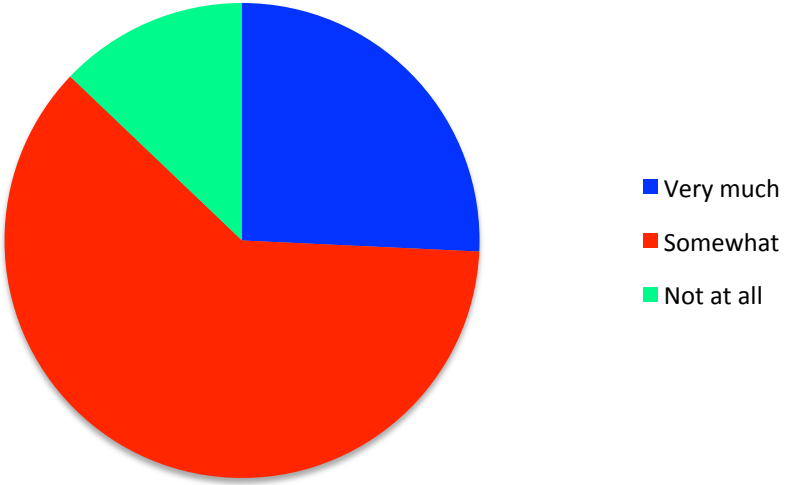


Quantitative Outcomes

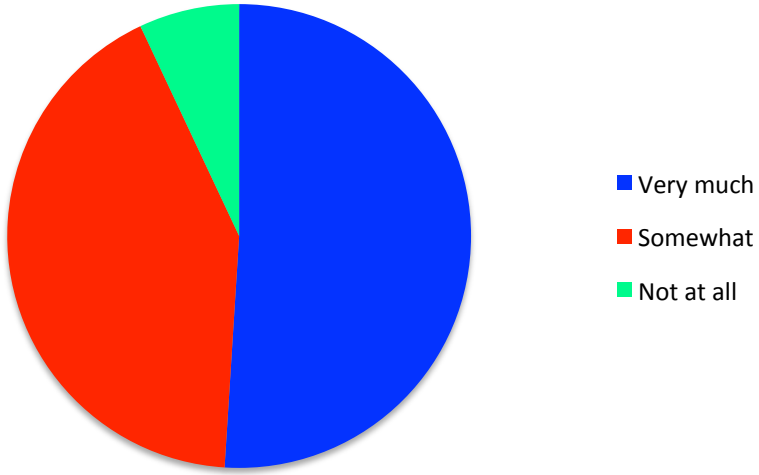


[our] videos helped me learn the key ideas in the course

Quantitative Outcomes (a telling one)



Did flipping help?



Did bi-weekly IFATs (tests) help?

(Mini-)Lectures vs Videos

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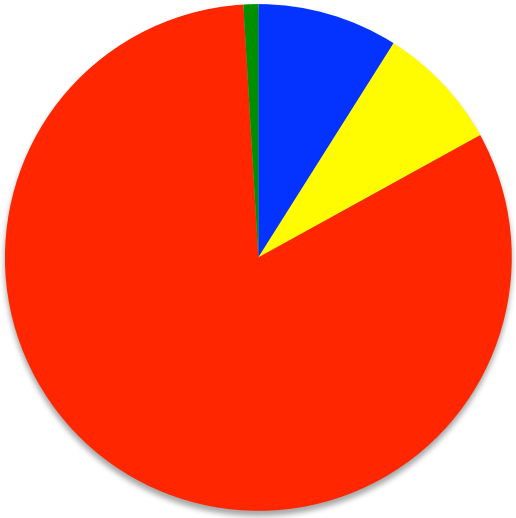
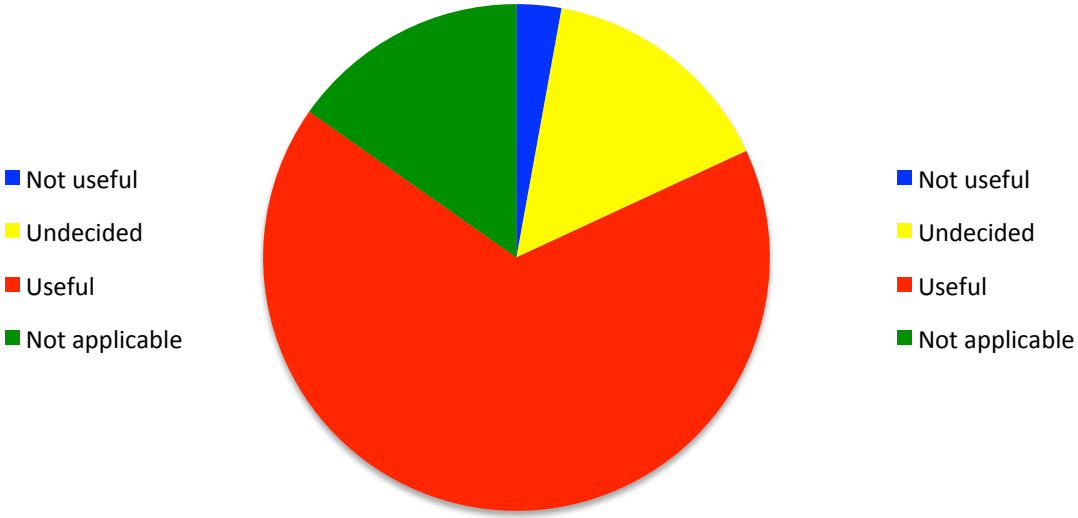
Lectures vs Videos

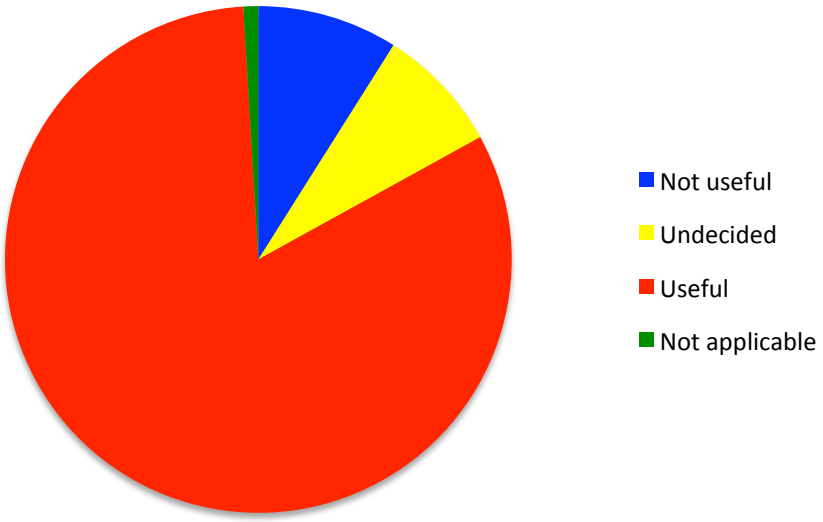




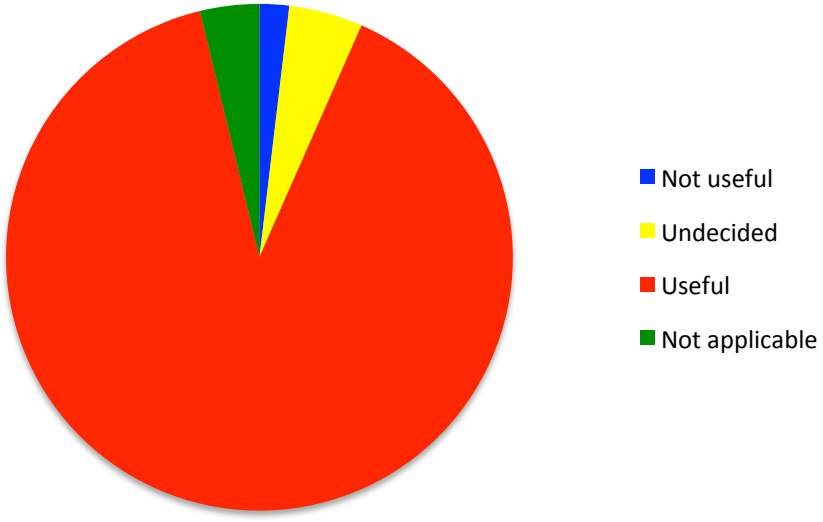
Lecturer videos

Live mini-lectures

Lectures vs Videos



Lecturer videos



Live demonstrations!

Qualitative Outcomes

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Quote 1:
This is a really good way of running a class…
I like watching videos, it's so much more helpful than just sitting in a lecture room...
For a video you can – you can take notes, and try pausing it if you have a question.
It's sometimes easier to lose track [in a lecture], and also, you can make a list of questions
…and just go to your professor and ask him.

Quote 2:
The ideal would be to have both [lectures and videos]

Surprising observations

- Public video content weak on TCs
- Worse-than-expected video "attendance"
  → grades same
- Video non-attendance
  → punished lab staff
- Solved the "phase problem"
- Not really good value (even ignoring the NRE)

Unsurprising observations

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- Low video “attendance” at lectures
- Students want BOTH lectures & videos
- Esprit de corps low
- ESL/working students especially prefer videos
- High-Q (best practice) videos appreciated

[Optional] End, Thank you…

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Wilf Malcolm Institute
of Educational Research
Te Pūtahi Rangahau Mātauranga o Wilf Malcolm
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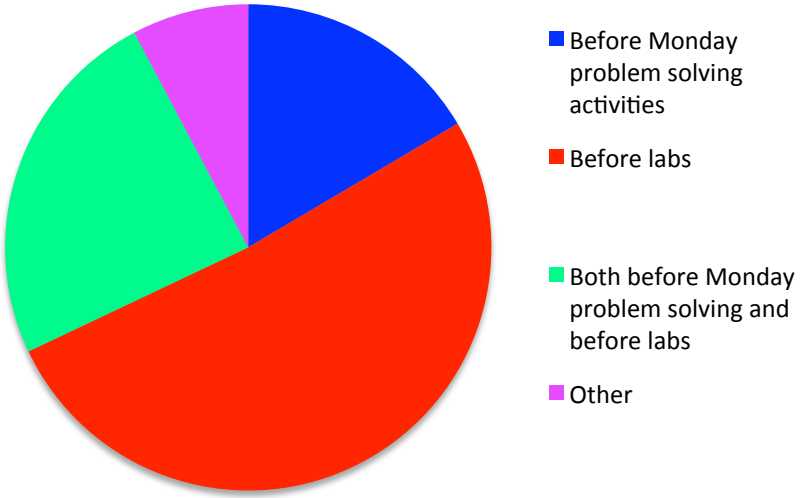
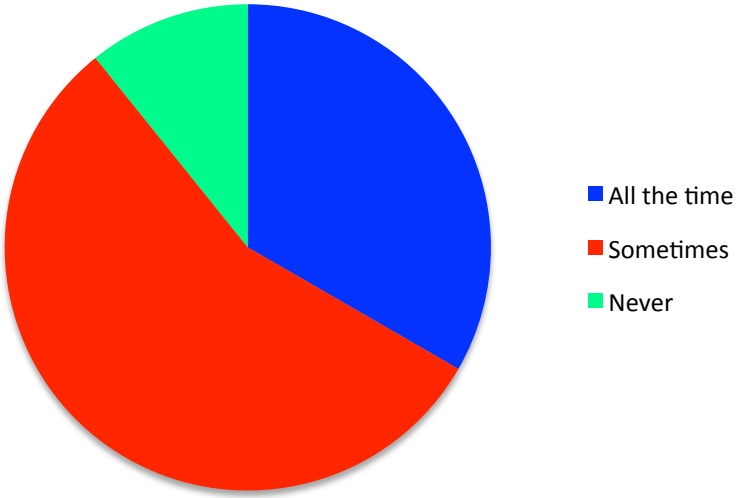
TEACHING & LEARNING
RESEARCH INITIATIVE
NĀU I WHATU TE KĀKAHU, HE TĀNIKO TAKU

Quantitative Outcomes

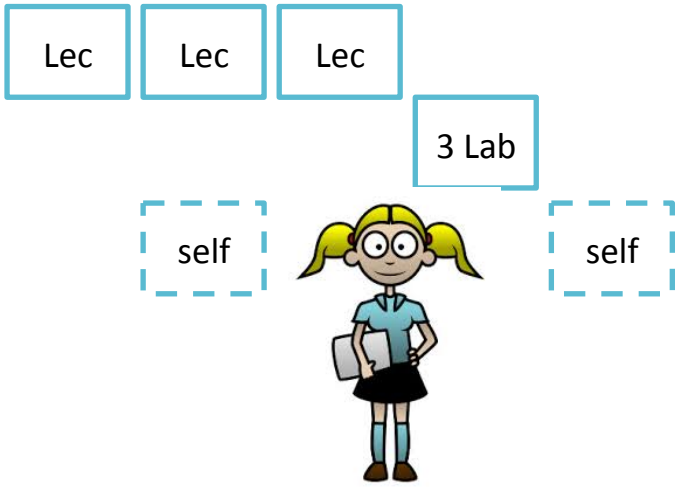


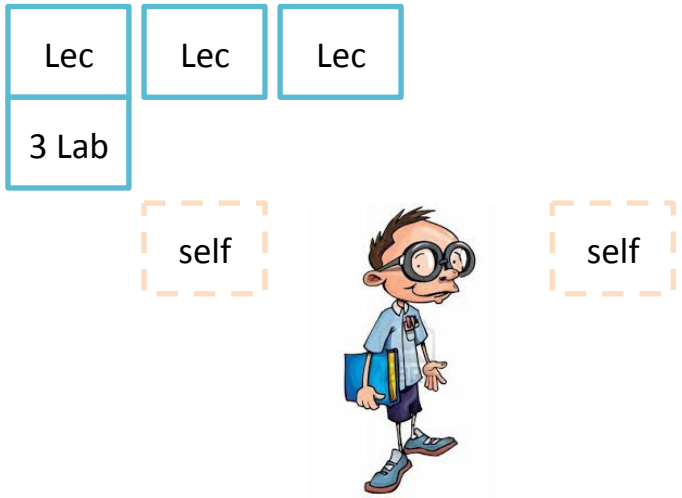
When did you watch?



Did you take notes?

The Phase Problem

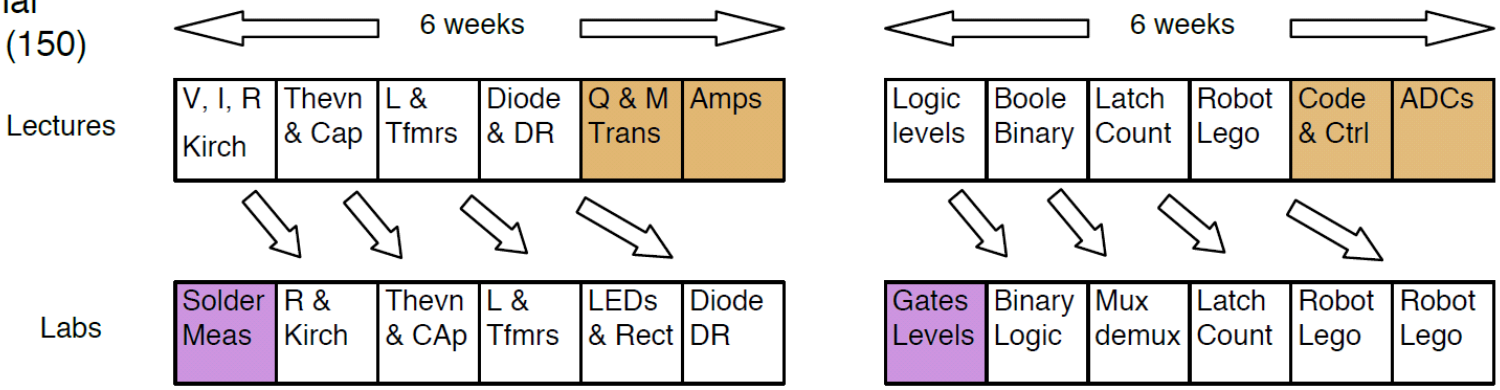




- Lectures: 135-155 people, run once
- Labs: 30 people, 5 repeats/week
- Lead time: 3—10 days per individual!

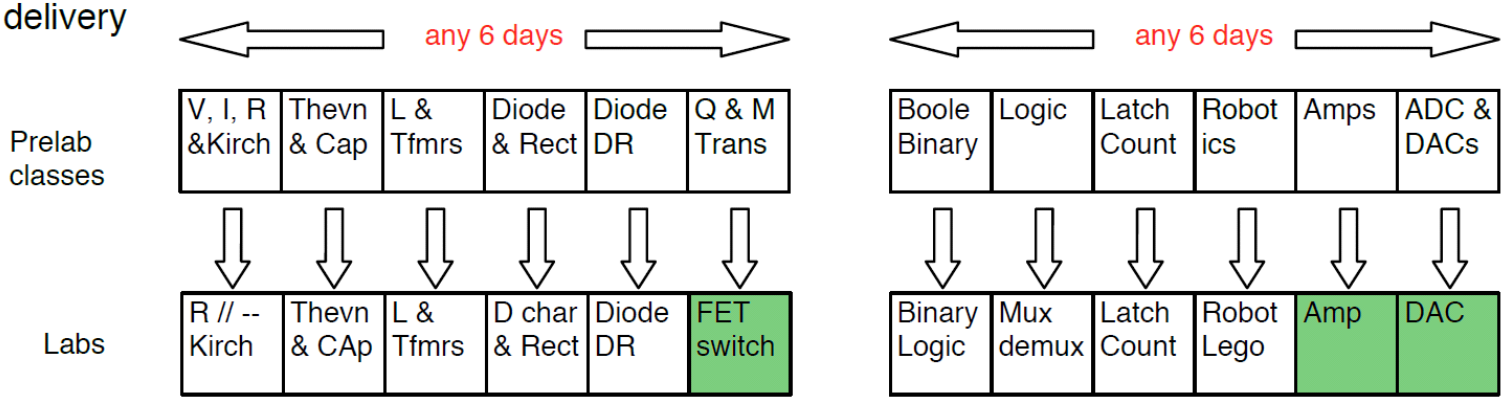
The Full Monte

Traditional delivery (150)



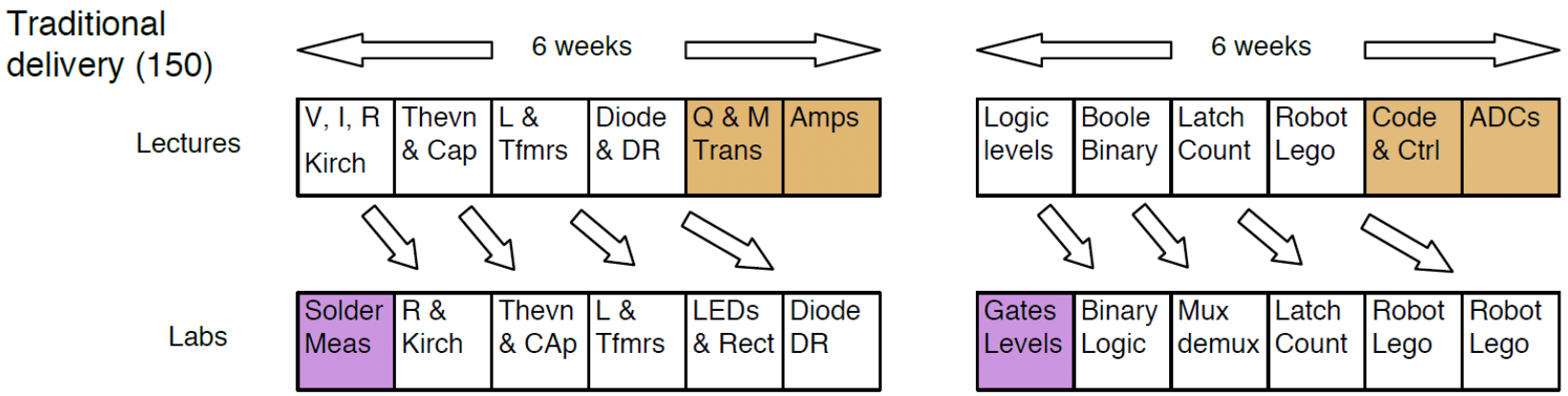
Phase delay-problem & lab rate limit causes "stand-alone labs" (no prep lectures) and "hanging lectures" (no associated labs)

Flipped delivery (n x 30)



Flip removes phase-delay problem; no "stand-alone labs", which in turn leaves fewer or no "hanging lectures" & permits addition of extra labs.

The Full Monte



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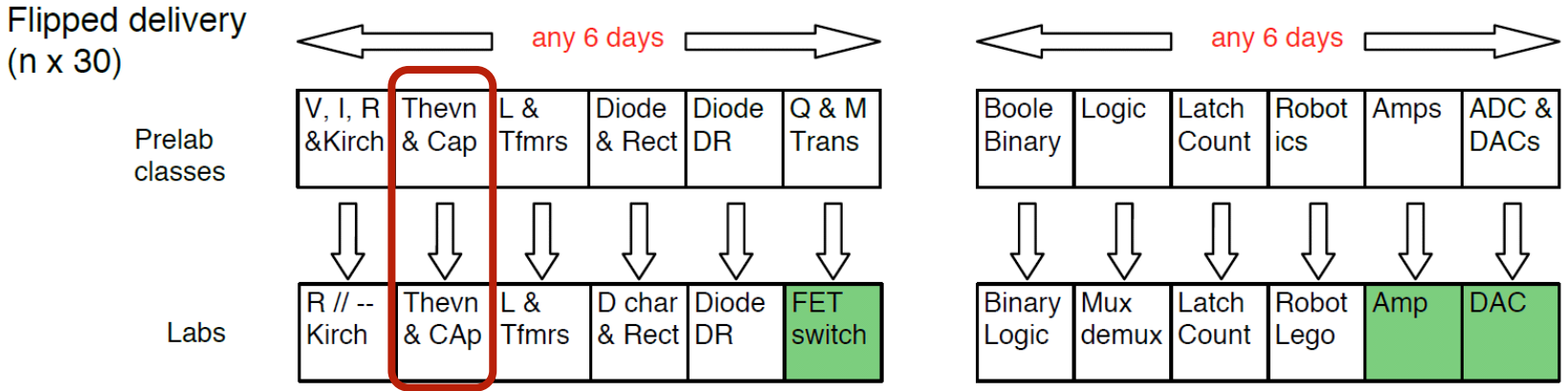

Flip removes phase-delay problem ... "stand-alone labs", which in turn leaves fewer or no "hanging lectures" & permits addition of extra labs.

Happens 5 times

...that Outcome

- Sliced paper into 5 independent parts
- Could run 5 staff and rank them

Lightboard videos

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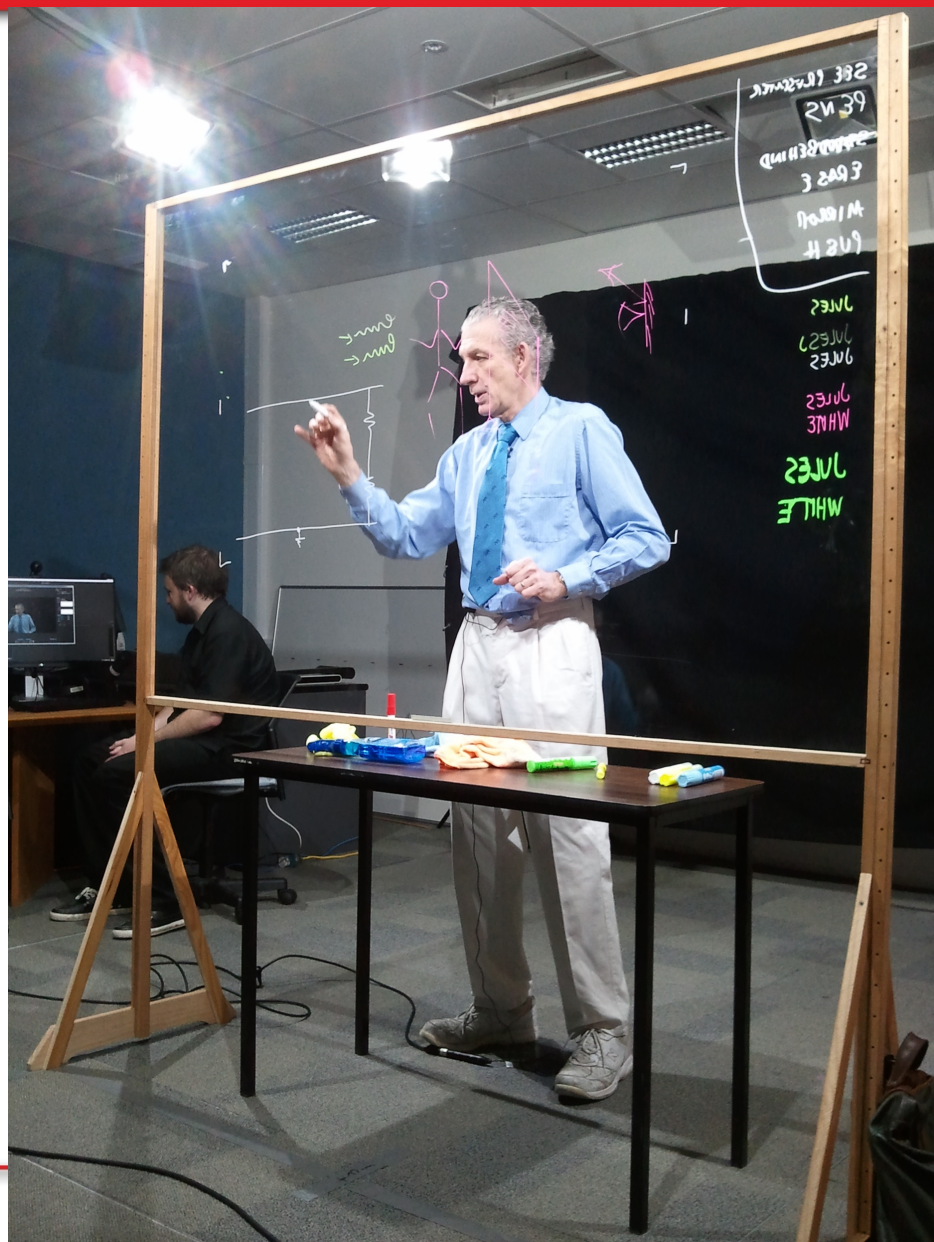

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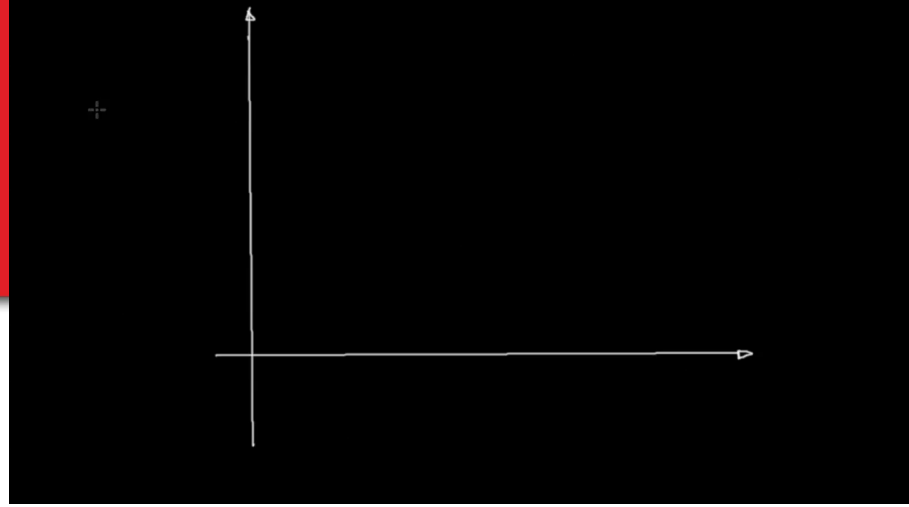

Best Practices in "Lecture Videos"

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Sorden (2008) effective methods for educational multimedia:

- Worked example effect
- Completion problem effect
- Modality effects
- Contiguity effect
- Personalisation principle
- Redundancy principle
- Pre-training principle
- Pacing principle

Guo, Kim & Rubin (2014) advise on creating "engaging" videos:

- Plan for and make short videos (under 6 min.)
- Use "talking heads"/human representations
- Production value might not matter
- Pre-production is important
- Declarative vs procedural videos

How we made the videos

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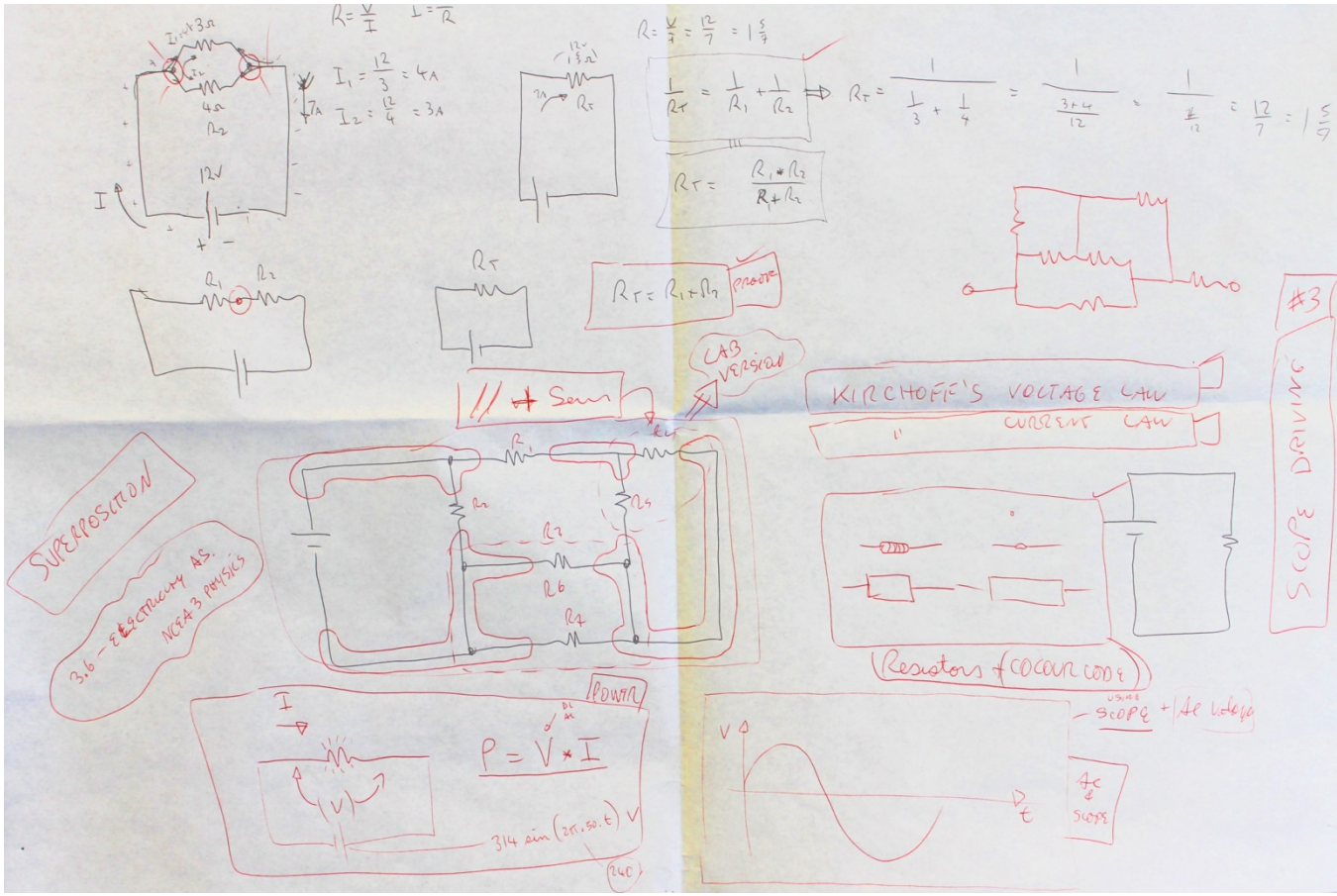
1st step:
Pre-production



How we made the videos

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2nd step: Filming in controlled conditions

How we made the videos

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3rd step: Reducing control over conditions

How we made the videos

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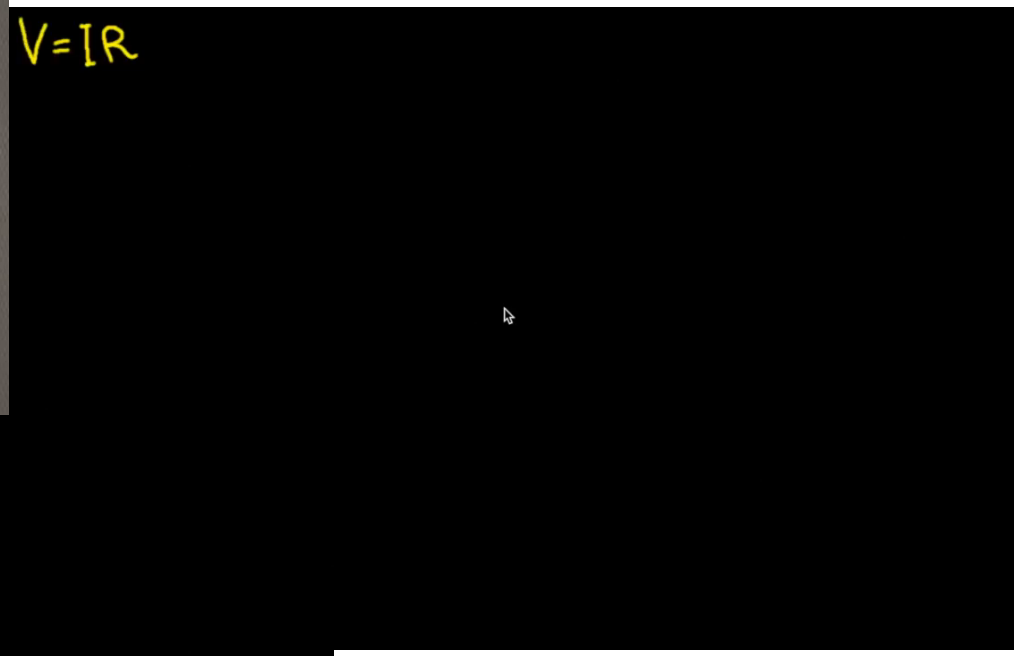
4th step: Post-production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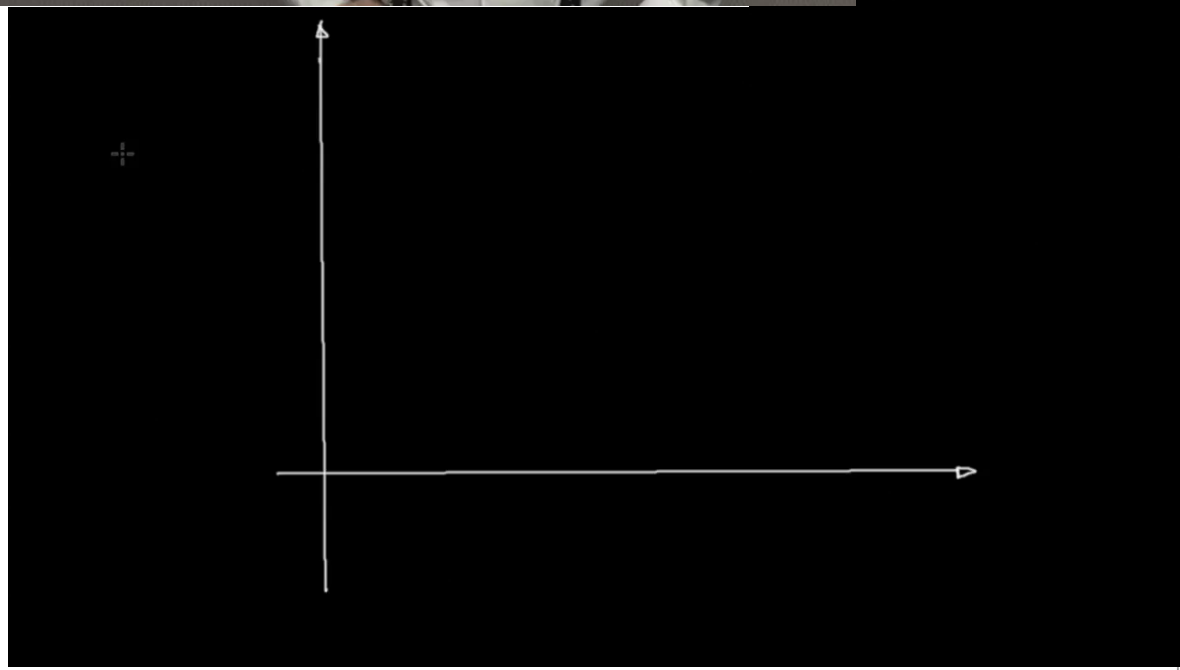


THE END
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