

# **Adaptive Learning: Opportunities for Flexible and Deep Learning**

**individualised learning  
adaptive testing  
confidence and proficiency**

**FYE 2015 Project  
Creating a path to success by providing avenues for  
individualised learning and catering for individual learning needs**

**Jurgen Schulte, Albert Ong  
SciMERIT  
School of Mathematical and Physical Sciences  
University of Technology Sydney**

## Aim

- smoother transition
- individual pathways to learning
  
- followed up by personalised feedback informed by learning analytics

## Approach (adaptive learning)

**1 large summative assessment:**  
solving physics/engineering problems  
(proficiency, not just performance)

- incremental steps guided by students' own pace and confidence
- permission to excel in areas of interest and be rewarded for it
- gamification, competitive

**Homework (adaptive learning): 50%**

**Practicals: 30%**

**Final exam: 20%**

## Adaptive Learning

**An educational method which uses computers as interactive teaching devices.**

**Computers adapt the presentation of educational material according to students' learning needs.**

## Adaptive Learning

- **Adaptive to learning ability** no or some discipline background
- **Adaptive to learning load** frequency of attempting problems
- **Adaptive to personal circumstances** periods of high/low level of practise
- **Adaptive to personal interest** show where you can do best
- **Adaptive to building up skills** repeat practise, building proficiency

## Adaptive Learning

- **Adaptive to learning ability** **low level entry, high level entry**
- **Adaptive to learning load** **24/7 access, all semester long**
- **Adaptive to personal circumstances** **continuous incremental work**
- **Adaptive to personal interest** **start and work on preferred topics**
- **Adaptive to building up skills** **continue any time where left off last**

**Let it cover the entire syllabus seamlessly**

## Adaptive Learning

**Let it cover the entire syllabus seamlessly**

**Let the student take control of own learning**

d-analysis

motion

forces

statics

momentum

energy

thermal

electricity

fluids

waves

optics

**The ability of the computer to adapt to the learner is a negligible feature**

# Adaptive Learning – Student's View



## Fundamentals of Physics 10e ORION

View as Instructor



SCHULTE, JU... ▾

Practice - 11.2: Start with "credit" of 20 problems/lives **body. - Practice**

TIME SPENT  
00 : 02 : 00

disciplinary skill

**Q 11.1:** Two identical disks, with rotational inertia  $I (= 1/2 MR^2)$ , roll without slipping across a horizontal floor and then up inclines. Disk A rolls up its incline without sliding. On the other hand, disk B rolls up a frictionless incline. Otherwise the inclines are identical. Disk A reaches a height 12 cm above the floor before rolling down again. What height above the floor does disk B reach?

 cm

skills required to solve problem  
no multiple guess choice

gamification

multiple honed trades lead to success

↑  
quantitative problem

confidence level  
time to solve  
proficiency, not performance

↓  
perceived own "strength"

### Performance in Last 10 Qs

own "shooting" track record



### About this Question

Question Difficulty

Difficulty

39.8%

Students got it correct

strength of "opponent"



Mark for Review

Confidence



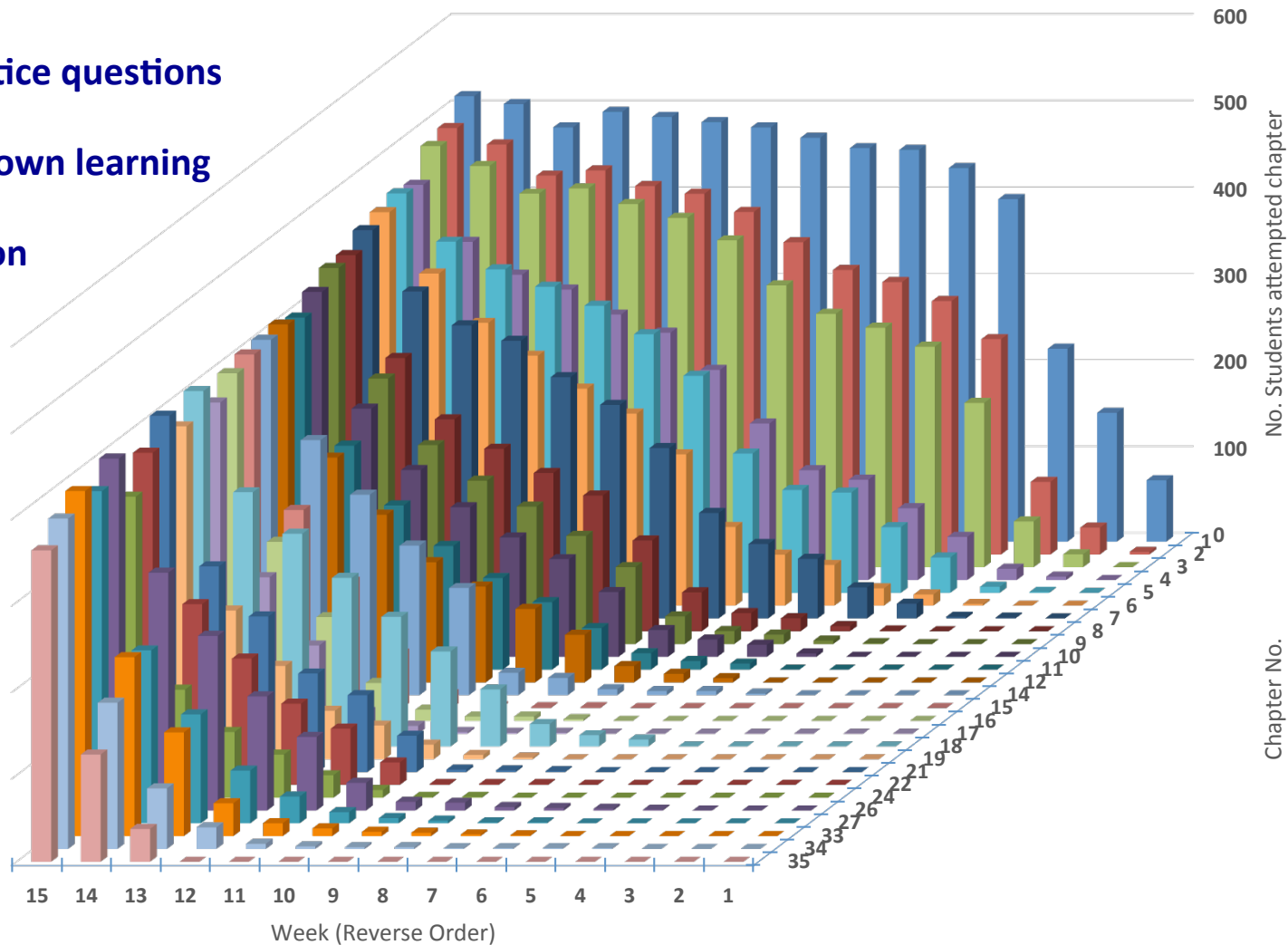
SUBMIT

Next round/level of problems depends on how this round has been completed

# Gamification

Weekly Cumulative Total Students Attempting Each Chapter (No Minimum)

more practice questions  
control of own learning  
gamification





# Adaptive Learning, Transition

**What did you value most about the assessment structure in this subject (50% Orion, 30% prac, 20% exam)?**

“Worked well for me. Engaging.”

“I think Orion is a fantastic tool but I would have used it more if the punishment for answering incorrectly was not so bad.”

“I liked that I could start where I had left off.”

“Made it easier to let me do it at my own pace. Since it was online I could do more of it from home.”

“Get marked on questions you do at home [opposed] to other subjects [where] you get marked mostly on test and assignments.”

“If something was due in another subject I could focus on that then come back to Orion knowing it’s not due yet.”

“It worked very well for me because I tend to stress when a final exam has a huge percentage weight.”

# Adaptive Learning, Transition

In your own opinion and from experience you may have had in other subjects, do you believe you had deeper learning experience this way [adaptive] compared to an exam-based assessment ?

Other subject you won't do many questions for each chapter but for this subject I was able to do many questions on all chapters which gave me a good depth of knowledge.

It was different because I was able to see improvements on a weekly basis. I didn't do physics at school. So this assessment task really helped me because I was able to do heaps of questions and track my progress.

Also, having a big focus on [problem solving] practise skills is much more valuable for overall learning.

I found I was much more involved with this style of assessment.

**Were there any other skills you developed throughout the process of this homework assessment task?**

Time management

Solve problems quicker

Confidence when problem solving

Visualise and solve problems quicker

## Individualised just-in-time feedback

“I liked that Dr Jurgen was able to send weekly progress reports to not only give us the proficiency scores but where we are sitting in the subject in order to get a pass. It was a source of motivation !!”

## Transition - student perspective

(compared to pre-uni and other traditional uni assessments ...)

### Past experience:

- **time-limited** (multiple deadlines throughout semester)
- **1-time performance** (class test, repeat mastery test, final exam)
- **feedback assessment triggered**

### Transition supporting experience:

- **self-paced “deadlines”, very small summative assessment steps (24/7)**
- **opportunity to compensate for deficiency in other areas**
- **gamification of progress**  
(challenge, loose, make up for mistakes, succeed, move level up)
- **immediate feedback, adaptive progress, feedforward feedback**

## Transition - academic perspective

(compared to pre-uni and other traditional uni assessments ...)

### Transition supporting experience:

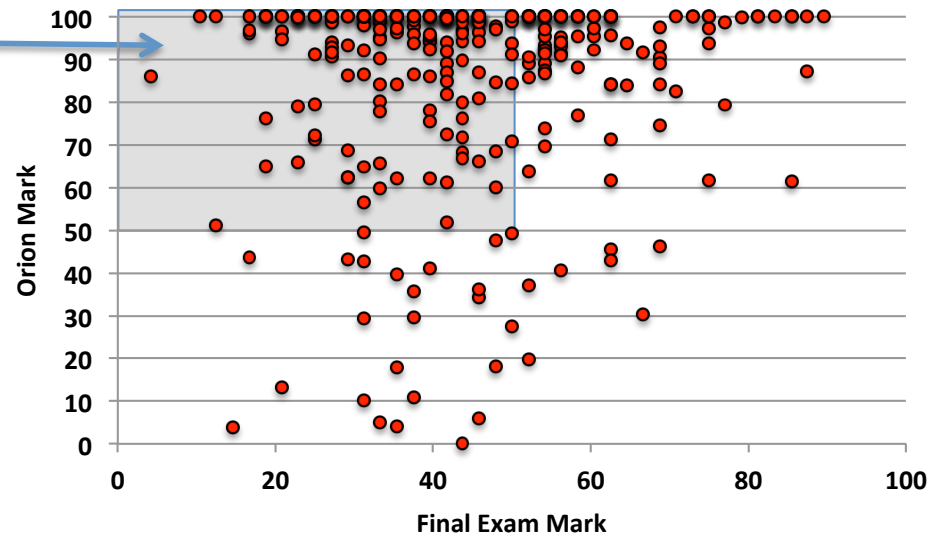
- self-paced learning
- self-testing
- approaching new material and re-approaching past material
- learning analytics informed personalised feedback to feedforward
- very low intermediate stakes , high end stake
- highly competitive and rewarding accordingly

# Improved Learning – Improved Success

## “Orion Mark”

Adaptive learning proficiency: 80% proficiency = 100% Orion Mark

Likely fail without  
adaptive learning



### *Final Exam*

Optional

72% participation

Opt out

28% opt out

Opt out pass rate

77%