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Modularisation of APSC180 Statics for delivery during terms
of different durations (winter 1, regular summer, Vantage summer) and to suit students with diverse prior knowledge

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Introduction

Currently APSC180 Statics is offered in three different terms: Winter 1, Vantage and regular Summers. The durations are 13, 8 and 6 weeks respectively. This project aims to modularise the course into a number lessons that collectively cover the syllabus.

The students in these three terms have a diverse background. By modularising the course, both students and instructors can decide which parts of the course to spend more time on. However, to cater to those whose learning needs are different from their classmates including those in PHYS112 Introduction to Physics for the Life Sciences I with no prior physics background, this project also aims to develop media and teaching materials for automated delivery and self-learning.

The structure of each module has been drawn up following the recommendations of a paper on flipped classrooms [1]. The recommendations are: 1) length of media should be approximately 10 minutes, 2) students are given time in class to work on problems, 3) bringing in real-life applications during class time, 4) having regular online assessments.

Two such modules were implemented in 2019 and the results showed that students who learned with media modules scored higher than those who attended live lecture, in the relevant midterm exam question [2].

Due to the pandemic, this structure was first fully implemented in the 2021 Winter 1 term. A slight change from the original structure is that the step 1 media was shown in class instead of being watched prior to class.

Student Feedback - Positive

The following are a selection of positive feedback from the 2021 W1 Student Experience of Instruction survey.
- Dr. Goh provides great visual explanations, using real life objects, animations and images.

The Original Structure of a Typical Module

This is the suggested method of teaching a module. However, it is not intended to be overly rigid, and variations are possible at the discretion of the instructor

Step	Whole Class	Individual Student		Instructor	Reference Duration
1	N.A.	Watch media, (introductory content). Answer poll/survey		N.A.	Prior to class
2	N.A.	Receive poll results, reflect on his/her perceptions compared to the rest of the class.		Comment on pre-lesson poll/survey result	10 – 20 min
3	Continue to watch media explaining the more complex details of the theory, followed by a worked example.	Answer conceptual questions		Pause at critical points in the media for conceptual questions. Comment on result and clarify misconceptions.	
4	N.A.	Solve computerised question which is the same/ substantially similar to worked example. Media of step 3 can be replayed on individual computers for reference.		Walk around to answer questions. Post questions and answers on discussion board.	30 – 40 min
5	N.A.	N.A.		Announce the activity in step 7 and time for everyone to be at the same point.	
6	Optional: Watch media explaining more advanced knowledge	Optional: Questions at higher level of difficulty for the faster students		Walk around to answer questions. Post questions and answers on discussion board.	Optional
7	Watch the solving of problem. Take notes, copy or solve along if desired.	N.A.		Solve a more complex problem on document camera. Emphasise strategy, breakdown into manageable steps, etc.	20 – 30 min
8	Reflect on topic objectives, summarise knowledge/ formulae/steps, etc.				

- The design of the class makes self–studying easier.
- One of the strengths was the "step one media" online which went over learning concepts efficiently and allowed for easily accessible review and enabled students to take their time in learning (pausing and rewinding material if necessary).

Student Feedback - Negative

A selection of negative feedback are:
- Less computer instruction, and more in–class learning.
- Eliminate the step 1 media and just teach it instead considering we are sitting in the lecture hall all together.
- The videos are a very poor choice for teaching. I feel that I didn't learn anything from them and don't feel like I learned anything in this course

Student Suggestions

- I often found that the easy stuff that was shown in the video took to much of the time leaving not enough time for the more complicated questions, forcing these to often be rushed.
- I believe that the media segments at the beginning of the lecture could be done on our own time, leaving us more time in class to look over other examples.
- This course could be improved by involving more real life demonstrations. While it may be difficult to accomplish, actually seeing some of these concepts in action may go a long way to benefit the learning of the average student.

References

1. Velegol, et al. (2015). The Evolution of a Flipped Classroom: Evidence-Based Recommendations. Advances in Engineering Education.
2. Goh, et al. (2020). Effectiveness of Media Modules for Blended Delivery of a Statics Course, Proceedings of the American Society for Engineering Education.

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