

System Design Project: Plans for Handling Rising Student Numbers

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Report prepared in consultation with the SDP 19-20 and 20-21 organising team members: Garry Ellard, James Garforth, Steve Tonneau and Barbara Webb.

For consideration by the Board of Studies meeting on Wednesday 19th February 2020.

1 Background

Our undergraduate student numbers are rising: our current first year is 15-20% larger than the year before which in turn is around 6% larger than the year before that. SDP is the dominant user of much of the space on Level 3 of Appleton Tower in the spring semester. Level 3 is special in that it provides support facilities for students creating robots and working with hardware. Currently the feeling is that Level 3 is at capacity.

How do we handle this rising number of students?

A preliminary proposal was brought to BoS on 20th November 2019 to make minor changes to the SDP Course Descriptor to relax the requirement that every student be involved in a project that uses physical hardware. After discussion at that meeting, at the 11th December 2019 BoS meeting, and with the course organisers, a decision was taken to keep the Course Descriptor the same, but bring back to BoS a report on the course organisers' plans for coping with growth in student numbers. This is that report.

2 Value of SDP as it is

Having students working with systems interacting with the real world through sensors and actuators is seen as really important. It is the only time in their 4 or 5 years of study that many of our undergraduate students will get exposure to key issues such as:

- how to cope with sensors that can be noisy and unreliable,
- how to handle actuators and motors that cannot be controlled precisely,
- how to program at a low-level, including dealing with hardware interfaces.

Also there is real value in having all students rubbing shoulders with each other in the Level 3 space.

3 Possible alterations to SDP structure and organisation

3.1 Reducing project scale, going to 10 credits rather than 20 credits

The SDP organisation team feels this would not give students enough time for a proper experience. Creativity and fun aspects would be impacted.

3.2 Running SDP twice, once each semester

Currently already significant use made of Level 3 space in Semester 1 by various courses. However, some might be moving, in particular RSS (Robotics: Science and Systems, a Level 11, NYT 5 course for MSc students).

One challenge with a Semester 1 run would be that no students will have first completed IVR (Introduction to Vision and Robotics): this runs in Semester 1 of Year 3.

Getting industry judges to also come in for Semester 1 should not be a problem.

3.3 Adjusting team sizes

Currently each team has 10 students. Demands on physical resources could be alleviated by having larger teams. However, a strong feeling of the organisers is that the SDP experience would be significantly poorer if teams were any larger.

3.4 Software-only projects

A disadvantage is that students then miss out on key issues such as those noted above in Section 2 and the social experience of being located on Level 3. Also students might feel like they are getting second class treatment.

If software-only option is just mentioned, then students will push for this, seeing it as easier. It would be hard then to prevent some students insisting on taking it up.

3.5 SLICC projects working on an autonomous racing car

The Edinburgh University Formula Student (EUFS) society

<https://eufs.eusa.ed.ac.uk>

builds driverless Formula One style racing vehicles in order to compete at the global annual Formula Student competition

<https://www.imeche.org/events/formula-student> .

Each year over 50 students from different disciplines contributed to the team's work.

A SLICC

<https://www.ed.ac.uk/employability/slicc>

is a Student-Led Individually-Created Course. The current system enables students over the summer at the end of their first or second year to gain 20 credits at Level 8.

Barbara Webb writes: my feeling is that it would be very hard to ensure that a SLICC had sufficient correspondence to the learning objectives in SDP to make it a viable ‘alternative’ course choice in the student’s programme. They would not get the workshop training and structured feedback on producing and working to a project plan. The teamwork dynamic would be there but rather different, e.g. much more option to choose who you work with, less option to decide what to work on. Also, I think weakening our position on the idea that SDP is an essential experience for Informatics students will open up future demands from many students to be allowed to substitute something else.

3.6 Incorporating SDP into 60 credit Semester 2 course

How about we combine SDP with PI and some other course (Security?) to make it a 60 credit course that students do for the whole of semester 2. This might make it more reasonable to e.g. split timing of demos to different days, require groups to book space/facility time etc.

4 Coping with physical space restriction of Level 3 AT

Typically each team needs a locker to keep hardware in, some table-top space including a computer, and possibly some floor space. Some might need particular floor setups, for example with fixed obstacles or ceiling cameras monitoring the floor area.

Possibly space could open up on Level 8 AT, but this is by no means certain and the timescale is unclear. We should not be planning on this possibility.

It is desirable to keep all teams based on Level 3 AT because of value of teams working in close proximity and having technician support readily available.

Ideas for actions that could help include:

1. Give project teams more of a steer early on towards projects that have a modest physical footprint, that will run on a small table top rather than needing some floor area. For example, projects using static grasping robots and turtle bots could be encouraged more.
2. Such projects would more likely have portable hardware, hardware that students might be able to take away and experiment with elsewhere.
3. Do away with any permanent desk space for each team. Rather insist that teams book time in appropriate experimental areas. The coordination for arranging these times becomes part of the overall project experience.
4. Already larger physical spaces with floor areas have to be shared between multiple teams and this is managed using a booking system.
5. Make greater use of simulators in earlier phases of the projects. This would help with initial development of software and avoids tying up lab resources.
6. Hold some project team meetings elsewhere in Appleton Tower, off Level 3.

5 Coping with demands on technical support

Some teams will be encouraged to use stock robot hardware rather than having to build some hardware themselves. This should ease some demand on technicians. Already this is being experimented with this year.

This year, in addition to the full-time lab technician Gary Ellard, we have a trainee assistant technician - Maryam Dar. Hopefully she should be with SDP for at least 3-4 years. We should plan on bringing on board further assistants so that there is overlap should she leave.

Currently we have one 80 hour student demonstrator role providing technical assistance, in addition to *Course Expert* student demonstrators providing expertise in given domains and one of the course TAs who provides some technical support. It should not be an issue in future increasing the level of student technical support.

6 Space required for events and workshops at the start of SDP

The current structure of having workshops rather than lectures is seen as important for engagement. When students book spaces on workshops, they are very likely to attend. Attendance at lectures can be a significant issue.

Some events could be run twice if numbers too high to find convenient spaces for them. Some workshops (e.g. on Project Management) could be moved off Level 3. Flipped formats, e.g. for the Technical Writing workshop, could scale better.

7 Space required for Project Fair at the end of SDP

Currently the Project Fair in IF G.07 is getting very crowded. However, this could expand into also IF G.03 or perhaps take over the atrium area in AT. The Fair takes place on the Friday of Week 11, so technically within teaching weeks, but usually after lectures have finished. It is conceivable that we could move it to the Monday of Week 12 if this were an issue.

8 Logistics of demonstrations and Project Fair judging

Each project team gives 4 assessed demonstrations over the course period, and industrial judges also assess each project at the Project Fair.

Currently each project demonstration and judging event takes place over one day, with each project team allocated 30 minutes. 20 minute slots for each project team were tried in 18-19, but this was found to be too short. At each event, each project team is assessed by two marking teams. We want multiple markers on each marking team to see each project, but it is not necessary that all markers see all projects. With careful organisation, it should be possible to still fit each of the demonstration events and the judging event into one day, even if the number of project teams rose from the 20 we have now to even 30.