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The Life and Times of "The Conference Project" for Engineers, Physical Scientists and Mathematicians

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The 2023 Foundation Year Network conference focused on an important theme: failures, mistakes, missteps and meanders in the foundation year context. It provided an important impetus for reflection: after all, the relative institutional 'success' of a programme of study will often be judged on a mixture of quantitative and qualitative data collected from, or about, students studying on the programme, for example, attainment, progression, and satisfaction. It is, therefore, too easy to overlook how the teaching staff view the processes, iterations, and risks taken in designing, teaching, assessing and iteratively improving programmes of study which are deemed successful within product-oriented metrics, achieved only through reflection on the intervening failures, mistakes, missteps and meanders by the 'insiders'. Herein, we detail a case study on a core component of our foundation year programme, the 'Conference Project', and provide a narrative on how it has iteratively developed, why specific decisions were taken, and the next iteration currently in development. The challenges of operational restraints and the triad of tensions between the expectations of teachers, students, and the academy will likely resonate with our colleagues' experiences, or, at the very least, highlight some pitfalls to be avoided.

Introduction

Regardless of how well a scheme of work or specific teaching intervention is envisioned, the reality of its delivery, the unforeseeable challenges along the way, and changing operational landscapes mean that one must recognise when it is time to react and adapt. Reflective practice is an overarching characteristic of delivering high-quality teaching and promoting high-quality learning (Kelchtermans, 2009; Coe *et al.*, 2014; Baker, 2021). Acknowledging the importance of reflective practice, and the barriers to reflection many face (Finlay, 2008), a number of reflective models or 'cycles' have been developed and are widely used throughout educational settings to scaffold reflection. Common examples include the 'Kolb', 'Gibbs' and 'Rolfe' reflective cycles (Kolb, 1984; Gibbs, 1988; Rolfe, Freshwater and Jasper, 2001). Considering the Kolb reflective cycle of experiential learning (Figure 1), where learning is considered a process grounded in

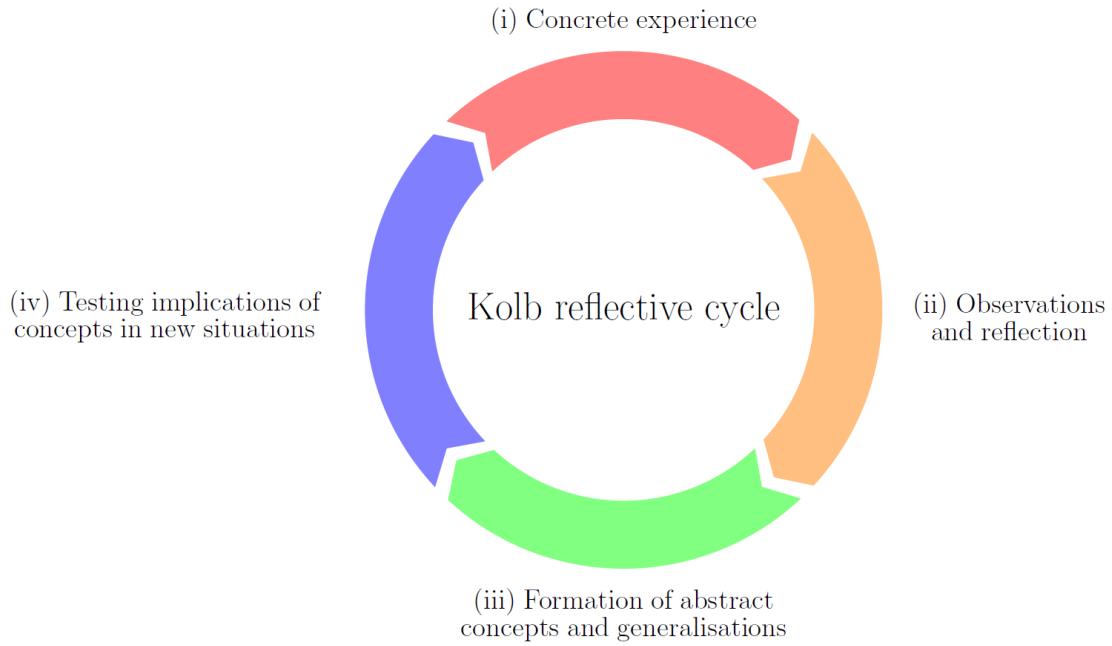

Figure 1. The Kolb's reflective cycle of experiential learning used to scaffold reflection on the iterative improvement of the Conference Project coursework-based assignment. (Vince, 1998)

experience, we use this model to scaffold reflections on how a specific teaching component of our foundation year (FY) programme has evolved over several academic years.

The Conference Project

Introduced as part of a new Foundation Year in Engineering and Physical Sciences at an English university in 2018, the 'Conference Project' is a coursework-based assignment undertaken by all students in the cohort during Semester 1 of the academic year (Dampier *et al.*, 2019; Spencely, Baker and Taylor, 2022). The Conference Project is one component of a 15-credit Computer Laboratory module worth 40% of the total module marks, with the other coursework components being Microsoft Excel- and MATLAB-based assignments, worth 30% each. Currently (cf. Figure 2), students individually produce a written review-style paper on a topic of their choice and deliver a five-minute live oral presentation summarising their paper using Microsoft PowerPoint slides to a small conference audience of teaching staff and other students from the cohort (totalling around seven people per conference group). The Conference Project scaffolds the learning and processes involved in researching and preparing an academic written piece of work including peer review, feedback, and action planning, as well as developing students' presentation, research and referencing skills within an authentic context. A fundamental aim of the module is to equip the students with a combination of digital- and computing-related skills and academic skills that would underpin their subsequent development. This becomes clearer from a sample of the module's learning objectives:

- Perform calculations, analyse data and prepare a customised chart using Microsoft Excel.
- Apply MATLAB operations and programming concepts to solve novel problems, create simple mathematical models and prepare graphical representations.

- Develop academic skills necessary for preparing a conference-style paper and a presentation in the context of a small conference.
- Use digital tools for effective research, accessing information, and referencing to support the preparation of the paper and presentation for the Conference Project.

In terms of coverage of the skills in both the digital and academic areas, it was clear from students' feedback and their academic performance on the module that the scope and depth of the content as well as the balance of coverage was appropriate. This was later corroborated by feedback from our students and colleagues in the undergraduate programmes when students encountered MATLAB again and carried out research-based projects and presentations. With time it became clear that the fundamental aim of the module was being achieved. Having demonstrated the efficacy of the module, aside from routine annual maintenance, it would have been reasonable to continue to deliver the module with the same structure and content. However, an area that we had identified for enhancement was the tenuous linkage between academic and digital skills, particularly the computing content. Although this had been considered at the design stage, the only formalised linkage was the requirement for students to include an element (which could be a descriptive element) of computational processing or mathematical modelling in their conference papers and presentations. The relative weighting for this element was not significant, and a substantial proportion of the students chose not to include this element. Although other digital skills such as using Microsoft Word and referencing tools were developed in the context of the Conference Project, a question remained concerning how we could implement a closer and more robust coupling between the academic and computing components and maintain this coupling for the duration of the module. This represents the next iteration of the Conference Project, discussed at the end of this article. First, we reflect on the iterations of the Conference Project since it was first introduced.

The Organisation of Student Committees

The lesson learnt: do not be afraid to adapt as you go along and to abandon things that do not work for you.

(i) *Experience*. Students were tasked to form sub-committees to oversee the presentation schedule, to peer review papers, and produce a conference proceeding (e.g., a book of abstracts). The rationale was to encourage members of the cohort to take responsibility for the tasks to better 'own' the Conference Project. (ii) *Observations*. Students struggled to understand what was required and often tried to absolve themselves of the responsibility by ignoring requests for sub-committee contributors. Instead, most students tried to wait out the calls for volunteers until they were told what to do by the teaching staff. Students needed more time to transition to the university environment and form a community with the cohort before this task would be feasible as a group, given that it operates in Semester 1 of the academic year. (iii) *Concepts*. This felt like a case of too much, too soon. Students of these subject domains typically undervalue the academic skills development proffered with these tasks (Felder and Brent, 2016; Baker and Heron, 2023), so it is somewhat less surprising that they do not readily accept such additional responsibilities. (iv) *Implications*. The additional 'selling' of these roles to students would likely require further scaffolding by the teaching staff, which, in addition to the cohort size doubling for the 2019/2020 academic year without additional resources, we had to accept that abandoning this idea and simplifying for the next academic year was necessary.

So, in the Life and Times of the Conference Project, the student committees only played a fleeting appearance. Similar approaches had worked for colleagues in other situations when

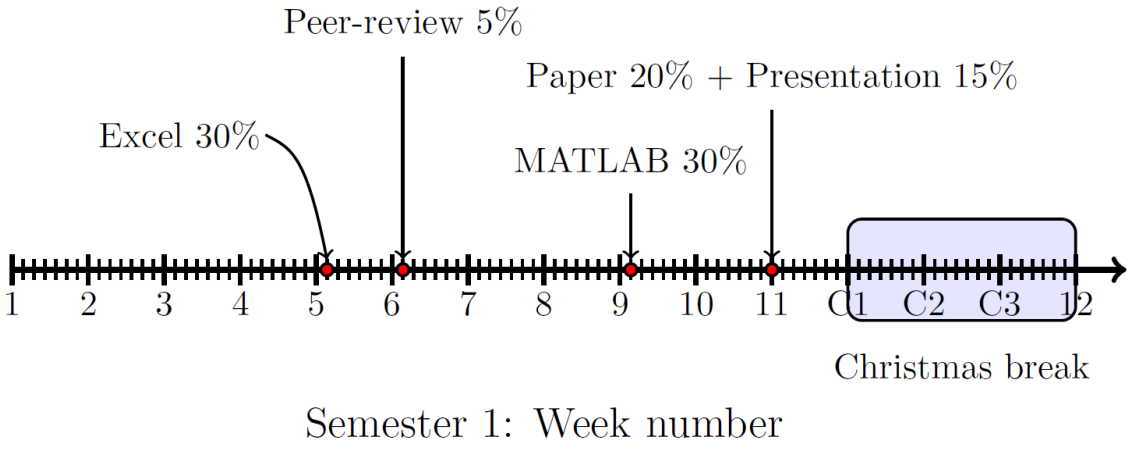

Figure 2. Summary of the assessment strategy for the computer laboratory module since the 2019-20 academic year. 'Week number' refers to the teaching week of the first semester of the academic year. Summative assessment weightings are given as a % of the total module marks. Collectively, the peer-review task, the paper and presentation form the Conference Project component. See text for specific implementation of these assessments.

teaching outside of the FY context, but it was shown that it was not the right time (Semester 1) for this activity and, with an anticipated stretching of resources on the horizon, this aspect of the Conference Project was abandoned.

Peer Review of Draft Papers

The lesson learnt: our students remain sceptical of the value of formative assessment and feedback; need to incentivise with summative marks, even if just a little bit.

Peer review is an integral part of academic work, and this aspect of the project was designed to introduce students to how an academic peer review system works in practice, as well as introduce the ideas and skills required to give, receive, and use formative feedback on a piece of work. (i) *Experience*. This was implemented as a non-assessed activity involving bringing a draft paper to a timetabled workshop, swapping with a partner and providing feedback. (ii) *Observations*. Very few students (< 10%) brought a draft version of their paper to the workshop. This meant that the students did not experience the value of receiving feedback on a draft version of their paper or have the opportunity to review other people's work and gain experience in giving constructive feedback. Further, many students did not experience the full process of preparing for and submitting a written university-level assignment, instead opting to rush something towards the final submission deadline (the summative assessment). (iii) *Concepts*. We needed to make the value of the activity more explicit and integrated into the requirements of the project. (iv) *Implications*. A practical solution to this problem was to require submission of the draft paper to the university's virtual learning environment (VLE) by a deadline, and then teaching staff to organise the peer "swap" and to assign marks (5% of the total module marks) to this activity. This solution was implemented into Iteration 2 of the peer review of draft papers activity.

Iteration 2 – The Peer Review Task was Weighted with 5% of the Conference Project Marks

We progressed into the 2019-20 academic year and the peer review task now had a weighting of 5% of the total module marks associated with its completion, see Figure 2. (i) *Experience*. This led to a greater proportion of the student cohort submitting a draft version of their paper (around 90% submitted a draft version). However, the logistics and administration involved with organising the peer review within a short timeframe were challenging. (ii) *Observations*. The student experience of the peer review process was reliant on other students. Many students had only produced a skeleton draft of their paper, stifling the opportunity to provide constructive feedback. (iii) *Concepts*. Time management and scaffolding of the assignment needed to be considered more carefully to encourage more timely completion of the draft paper. Furthermore, elements of the exercise that did not rely on other students were required to enhance student learning. (iv) *Implications*. Therefore, an exercise (5% of the total module marks) was set up on the VLE with four elements to be completed by the students:

1. Mark a sample paper.
2. Seek feedback on their draft paper from a peer, academic skills advisor, or academic teaching team member and document this feedback.
3. Self-evaluate their draft paper using the published marking criteria.
4. Create an action plan for completing and submitting the final paper using the feedback received and the self-evaluation of their paper.

Iteration 3 – Reliance on Other Students for the Peer-review Process was Removed

After the success in increasing student engagement in submitting a draft for peer review, we progressed into the 2020-21 academic year with online alternatives to the teaching sessions during the period of emergency remote teaching due to the Covid-19 pandemic (Baker and Spencely, 2020, 2023; Zamora-Antuñano *et al.*, 2021) and adopted a VLE-based peer review exercise that removed the reliance on other students for the peer-review process. (i) *Experience*. All students attempted this online exercise, although some only completed parts of it. (ii) *Observations*. Engagement with the marking criteria and assignment requirements increased (more questions about the assignment were asked in classes, for example) by getting students to mark a sample paper using the marking criteria for the assignment. This was likely because the task could be completed by all students even if they did not have a draft version of their paper ready for review. This was further confirmation that time management and action planning skills needed development for most students. (iii) *Concepts*. The format of the exercise was good and more sustainable with increasing numbers of students. However, we needed to further supplement time management and action planning skills development, and increase engagement with the project. (iv) *Implications*. Continue with this format of the exercise, continuing to enhance time management skills development and engagement activities.

Iteration 4 – Scaffolding Student Motivation

We moved into the 2021-22 academic year without any significant changes to the Conference Project. Most of the cohort completed their peer review tasks thus developing experience and skills in this academic area. The largest weighted components of the Conference Project, the final written submission (20%) and the presentation (15%) take place towards the end of Semester 1, and after both the Microsoft Excel and the MATLAB pieces of coursework, both worth 30% of the total module marks. By this time, the Microsoft Excel coursework marks are

released to students, but the MATLAB marks come after the Conference Project presentation. This year, the students received their marks and feedback for the MATLAB coursework earlier than expected, importantly before the final submission and presentation components of the Conference Project. (i) *Experience*. Several students' effort levels dipped once they calculated their required mark to pass the module overall was low, or already achieved. (ii) *Observations*. Motivation to expend effort dips if rewards are not tangible to the student (e.g., marks) despite the shared learning objectives of knowledge and skills that would be beneficial for future assignments and study. Some students will not put in effort for the reward of learning something. Ironically, many of those who experienced reduced motivation were, by virtue of passing the module at this point, high achievers on the other module components at this point. (iii) *Concepts*. Student motivations need to be considered. High achievers are not always self-motivated, and this appears to be compounded by the lack of interest which often pervades physical science students in some areas of academic skill development (Felder and Brent, 2016; Baker and Heron, 2023). (iv) *Implications*. The timing of the marks being released was amended and extra motivational support in the form of foundation year alumni mentors was employed, to share the benefit of the skills being developed for future undergraduate programmes (Spencely, Baker and Taylor, 2022).

Iteration 5 – Students to Beget Student Motivation

Following a successful bid for internal funding during 2021-22 and continued in the 2022-23 academic year, we established a peer-assisted learning scheme (PALS) where mentors were recruited from the FY alumni (Spencely, Baker and Taylor, 2022). The aim was to address, at least in part, the need for extrinsic (to the teaching staff) motivation for students to engage in the Conference Project learning objectives. Our FY alumni now pervade all FHEQ Levels 4-7 as well as industrial placement years. These students, therefore, boast a wealth of relatable and credible experience to discuss with our current FY cohort, particularly now they have used many of the academic skills being developed as part of the Conference Project, for example, interviewing for placements, presenting to groups, and academic writing in dissertations. (i) *Experience*. foundation year students were not opting into the university-wide mentoring schemes or seeking advice from the central Academic Skills tutors. Therefore, we introduced a compulsory module-embedded version of the mentoring scheme tailored for our FY cohort of students. (ii) *Observation*. "Insider knowledge" shared by the mentors was deemed valuable by the students, with mentors successfully able to bridge any gaps between students' understanding and the module leader's expectations (Spencely, Baker and Taylor, 2022). (iii) *Concepts*. Credible voices repeating or explaining the future benefits of current learning opportunities are valued by many students. (iv) *Implications*. Funding for continuation of the scheme for future cohorts is in place and further evaluation review will take place to better unpack and scrutinise the possible benefits to FY students and their mentors.

What's in the Future for the Conference Project?

Reflecting on this student assignment, as already alluded to in the introduction, it was envisaged that the Conference Project could form the link to couple together the academic and computing skills components of the module. Some modifications would be required to achieve this. Modifying the MATLAB or Excel components could feasibly strengthen the existing coupling as it was already a requirement in the assessment criteria that an element of computing or mathematical modelling must be included in the Conference Project. Two drawbacks of this approach would be that (1) the Microsoft Excel and MATLAB components are not synchronised with the delivery

of the Conference Project and (2) Microsoft Excel or MATLAB could be used to generate content for the Conference Project but would not necessarily lend themselves to achieving a strong coupling of the academic skills component with the computing component. Put another way, we wanted to design the Conference Project so that it would not be possible to complete it successfully without the development of specific computing skills in parallel with the academic skills development. This naturally led us along a design path involving the introduction of new computing content and a shift in the assessment strategy for the Conference Project. The initial idea centred on what we envisaged the student output would look like at the end of the module to demonstrate that they had developed a good grasp of academic skills and technical computing skills. Instead of submitting a conference paper in a Microsoft Word document and delivering a Microsoft PowerPoint presentation, we investigated the plausibility of a web-based article and presentation. This approach would likely help to realise the goal of achieving stronger and continuous coupling since technical skills such as working with HTML and JavaScript could be developed in synchronisation with students' academic skills development and the development of the content for their Conference Project. To that end, we have now introduced a new, specific learning objective to reflect the proposed changes: to use HTML/CSS and JavaScript to develop and host a webpage in the GitHub environment. The implementation of this learning objective will be through lectures and practical laboratory worksheets.

At a more discrete level, the technical learning objectives for the first 3 weeks are:

- 1.1 Create a GitHub account and apply settings for initial webpage deployment.
- 1.2 Gain familiarity with HTML editing on GitHub.
- 2.1 Design webpage layout and organisation of information.
- 2.2 Format text for the web.
- 2.3 Format tables.
- 2.4 Insert hyperlinks to external URLs such as embedded references.
- 3.1 Embed JavaScript in HTML to create more sophisticated webpage functionality.
- 3.2 Know how to use standard code to access external JavaScript libraries.
- 3.3 Use JavaScript to create and customise a chart using the Google chart libraries.

The students can continue to work on their web page and enhance the appearance and formatting whilst also developing the written content for their online article. Depending on the type of content, for example, in using images, they would also need to make adjustments to the coding for the webpage to display their content aesthetically. Later in the semester, in Weeks 9 and 10, further sessions can be introduced so the students can focus on implementing their presentation within their webpage. The discrete learning objectives corresponding to the technical side of the presentation phase are amended to:

- 4.1 Prepare images (slides) for uploading to a webpage.
- 4.2 Format web-based slide show for presentation.

Therefore, the next iteration of the project will involve a major re-design of the project with an emphasis on developing the breadth and depth of students' digital capabilities, beginning in the 2023-24 academic year. The content of the Conference Project will be hosted on a webpage that will be designed and developed by the students working with HTML/CSS and JavaScript in the GitHub environment. The paper will be written in the style of *The Conversation* (2023), a "gateway" online publication that bridges the gap between academic and journalistic writing. We anticipate that preparing the written article and presentation as web content will provide a more integrated approach, facilitating the parallel development of digital skills, acad-

emic writing, and presentation skills. Furthermore, we think that we will observe improvements in student interest and engagement as well as provide a stronger framework for the co-development of digital and academic skills within an authentic and meaningful context. Coupled with continued enhancement of engagement and student motivation via credible student mentors in the PALS mentoring scheme through continued interventions, this should mark a significant next iteration of the Conference Project and one to be evaluated in the future.

Concluding remarks

We reflect on the challenges faced in developing a core component of our foundation year programme, the 'Conference Project'. It involves several tasks designed to develop a range of academic skills which are critical to university studies, and beyond. We discussed how an intended sub-committee of students to produce conference-like components (e.g., conference proceedings) was difficult to establish since students did not intrinsically value these opportunities. Whilst there are improvements available to address this issue, forthcoming operational restraints meant that this could not be adequately addressed in its current form, subsequently being dropped from the Conference Project. Peer review is a key component of the Conference Project tasks, and several iterations over academic years recount the observations and rationale for the iterative development, leading to its current incarnation. Eliciting the students' voice and working with students through staff-student partnerships has provided new directions to evolve the Conference Project. Of course, with any redevelopment, it is likely that the realities will not match our expectations, but the main difference now, as we have learned through this process, is that it is all part of our learning cycle.

Acknowledgements

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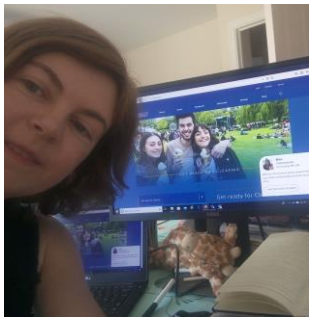

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