

## **HE Bioscience Teacher of the Year 2021 Application Form Dr Nigel Francis – Swansea University**

### **1. Individual excellence in the development and implementation of approaches to teaching**

*In not more than 500 words please outline, with evidence (references are not included in the 500-word limit), detail how the candidate displays individual excellence through the development and implementation of approaches to teaching that have proven successful in promoting bioscience student learning and achievement.*

Teaching innovation in my subject area of immunology is the central tenet of my pedagogic approach and this claim. My students have recognised my use of innovative, interactive media as excellent through institutional and national awards. These include peer nomination for Swansea University's Teacher of the Year (2019) and student nominations for HEBTOY (2019), the British Society of Immunology Teaching Excellence Award (Winner, 2020) and Swansea University's Excellence in Learning and Teaching Award (Winner, 2020).

“Dr Francis has made great strides in developing a range of novel immunology learning resources. His passion obviously lies in empowering his students, so they are enthusiastic and confident in choosing to studying immunology at both undergraduate and postgraduate levels.” - Student

I was the first academic in Swansea University Medical School to adopt the flipped classroom approach. Inspired to replace didactic, lecture-based sessions with interactive, student-focused sessions I produced a series of short videos that allowed students to engage with the taught material in their own time before attending a small group face-to-face teaching session. In these sessions, students were able to vote on the topic(s) they struggled most with via polling software, allowing tutors to specifically tailor the teaching for each group to their area(s) of misconception. Reflection on the initial success of this approach led me to the introduction of peer-led teaching and experiential learning. Now, students attending tutorials work in pairs or small groups to address problems before feeding back to the rest of the tutor group their approaches and solutions. This allows groups that have adopted different approaches to problems to engage in discussion, facilitating deeper learning and formed the basis of the 2019 paper in Biochemistry and Molecular Biology Education. The introduction of the flipped classroom coupled with peer learning saw a significant increase (7.1%,  $p < 0.05$ ) in student performance and student satisfaction rose from 3.7/5 in 2016/17 to 4.2/5 in 2019/20, with 5 being the maximum score. During the COVID-19 era, short formative quizzes have been embedded into the videos to allow tutors to identify topics for discussion based on student misconceptions.

I am viewed by the sector as an expert in this teaching methodology, regularly being asked to review publications in this field. I also contribute to the wider adoption of this approach within the university, leading on staff development sessions and the creation of case studies for CPD resources. The evaluation of this methodology led to a peer-reviewed publication with student partners and a subsequent invitation to present at Surrey University's Learning Lunch seminar series to help academics appreciate the application of experiential, peer-led learning.

*After Nigel's talk, I am continually refining and improving the way in which flipped learning can ignite more passion for learning that embeds skills employers look for." - Dr Tim Brown – University of Surrey*

I continue to share best practice in flipped learning, with a second peer-reviewed paper in preparation, also with student partners, investigating student performance linked to engagement with material, attendance at face-to-face seminars and prior subject knowledge from A-level.

**(500/500)**

## References

- 1) Francis N.J. (2019) The Flipped Classroom – Becoming a Better Teacher. *Advance HE*. <https://www.advance-he.ac.uk/news-and-views/flipping-the-classroom> - published 20th March 2019.
- 2) Francis N.J., Morgan A.H., Holm S., Davey R., Bodger O. and Dudley E. (2020). Using a flipped classroom approach to teach calculations. *Biochemistry and Molecular Biology Education*. 48(3):220-226. doi: 10.1002/bmb.21328
- 3) Slade V.E., Bodger O. and Francis N.J. (*In preparation*). Engagement, not prior subject knowledge, predicts performance in a flipped classroom model of molar calculations.

## Presentations

- 4) Invited speaker – Swansea University (SALT) – 7Cs series – Becoming a Better Teacher - The Flipped Classroom – 6<sup>th</sup> March 2019
- 5) Invited speaker – Swansea University (SALT) – 7Cs series – Becoming a Better Teacher - The Flipped Classroom – 15<sup>th</sup> May 2019
- 6) Invited speaker – Swansea University (SALT) – TEL Week – Blended and Flipped Learning – 23rd May 2019
- 7) Invited speaker – University of Surrey – Learning Lunch – Becoming a Better Teacher – The Flipped Classroom – 26<sup>th</sup> February 2020

## 2. Involvement in scholarly and professional development activities

*In not more than 500 words please describe all scholarly or professional development activities that the candidate has undertaken, which have influenced and enhanced the learning of bioscience students.*

Groupwork is a complex and challenging pedagogical approach to conduct whilst satisfying all the needs of all learners. My interest in refining groupwork through engagement with professional development opportunities and pedagogical literature came about from reflecting on an unsuccessful first attempt using this approach. Subsequently attending a CPD workshop delivered by Dr Kate Exley started me on a seven-year journey to optimise groupwork. Reflection on student feedback alongside combining proven pedagogical approaches has led to the development of a robust assessment that remains inclusive and accessible to all. Student feedback has allowed me to embed the student at the centre of this approach, providing a scaffolded framework that guides students through the

assessment requirements. This is supplemented by a series of semi-autonomous checkpoint mechanisms that include student-authored diaries to track task engagement, which was further enhanced by using online wikis, allowing tracking of individual student contributions. This is coupled with a student-driven reporting system adapted from Lejk *et al* (1996) that allows groups to request non-participating students receive a 'yellow card'. Following a supportive meeting with me to discuss their lack of engagement with the task, if the warning is upheld then the student is advised that their overall mark will be reduced by 20% unless they can demonstrate improved participation, in which case the card is rescinded and full marks can be achieved. However, if the group requests a second warning then the student may be issued with a red card, which removes them from the group task so as not to disadvantage remaining members. The result of these interventions has seen a dramatic increase in student engagement with the task, resulting in only 1 meeting with a student in the past 2 years, which subsequently allowed the student to be identified as struggling and the provision of additional support mechanisms.

The literature suggests that students are well placed to judge group participation (Gordon, 2010), therefore, WebPA was introduced, which allows group members to anonymously rate each other and themselves on a series of defined criteria. These ratings are used to adjust the proportion of marks that are allocated for group dynamics. The use of Buddy Check as an alternative to automate this process is currently being investigated.

Whilst drafting my HEA fellowship I realised the power of self-reflection as a feedback tool, to harness this, students are asked to write a formative reflection on their performance to demonstrate what they have taken from the task, highlighting what they did well, could improve and need to start doing in subsequent, similar assessments. Over the past 3 years over 65% of students have participated in this voluntary task, compared to around 20-30% who normally access feedback comments via the VLE.

Student satisfaction with this combination of approaches is very high (5-year average 4.5/5). I shared this best practice approach through an oral presentation at the Advance HE STEM 2020 conference and have authored a review of using groupwork from the academic perspective, which is currently under review in Cogent Education.

**(500/500)**

## **References**

- 8) Francis N.J., Allen M. and Thomas J. (*Under review*). Using group work for assessment – an academic's perspective.
- 9) Gordon, N. A. (2010). Group working and peer assessment—using WebPA to encourage student engagement and participation. *Innovation in Teaching and Learning in Information and Computer Sciences*, 9, 20-31.
- 10) Lejk, M., Wyvill. M. & Farrow, S. (1996). A survey of methods for deriving individual grades from group assessments. *Assessments and Evaluation in Higher Education*, 21, 267-280.

## **Presentations**

- 11) Advance HE STEM 2020 Conference – The Studio, Manchester – The Future Graduate – The Importance of Group Work – 29<sup>th</sup> January 2020

### 3. Supporting colleagues and influencing learning

*In not more than 500 words please provide evidence of how the candidate supports colleagues and influences bioscience student learning beyond their department and institution.*

The COVID-19 pandemic has created a range of challenges for the delivery of teaching in HE, not least the provision of authentic laboratory experiences for life science students when universities were forced to shut their physical doors in March. To address this challenge, at the start of the pandemic, I pioneered the development of a #DryLabsRealScience network, which has evolved into a national community of practice to support academics in the life sciences, as they transition from wet to dry lab provision. The network has offered practitioners the opportunity to share innovative dry lab teaching practice across an international membership. With support from Dr David Smith (Sheffield Hallam University) and Professor Ian Turner (University of Derby), the network has grown to around 200 life scientists from over 70 organisations. Chairing and organising all the seminars has provided me with the opportunity to influence the provision of laboratory practice during COVID-19 and beyond, with many colleagues identifying alternatives to wet lab practicals and projects. The impact and reach of #DryLabsRealScience has increased through partnership with the lectuREmotely website, which hosts recordings of all the presentations, a series of resources including short “how-to” guides and infographics of free resources for a range of the projects and topics presented. The website has had over 12,400 visits from 53 different countries across 6 continents, highlighting the truly global reach and impact of the network beyond the immediate learning from the webinars.

*“Just wanted to say that this is a really terrific initiative you are pulling together here. The collaboration and sharing has been truly amazing - so thanks again.” - Professor Momna Hejmadi – University of Bath*

My involvement in this project has resulted in me being invited to present at the Bioscience Education Summit 2020, writing two blog articles for Advance HE and an article for The Biologist (Royal Society of Biology magazine) to share best practice with the wider RSB audience. Plans for the future include establishing an annual virtual conference to enable the continued sharing of good practice and to provide a platform through which academics can search for ideas and gain advice from colleagues already using these approaches.

Acting on ideas generated from the network I created a series of videos that demonstrate lab safety, the correct usage of laboratory equipment and experimental set up with embedded quizzes for students to check their understanding and better prepare students for lab-based teaching ([https://www.youtube.com/playlist?list=PLAHC5dcr11HJ3ZDd8f14\\_zCBzRr6Z-g2g](https://www.youtube.com/playlist?list=PLAHC5dcr11HJ3ZDd8f14_zCBzRr6Z-g2g)). Additionally, recordings with deliberate mistakes have also been created, allowing students to identify the errors or predict the outcome on an experiment based on an error, which can be used as part of an interactive session. During COVID-impacted teaching these resources have played a key role in better preparing students for the limited lab time available, allowing them to gain a better theoretical understanding of the methodologies used, maximising their time within the lab. To support academics at other institutions, these videos have been made freely available via lectuREmotely to the international audience.

**(494/500)**

### References

- 12) Francis N.J., Smith D.P. and Turner I. (2020) #DryLabsRealScience – together stronger. *Advance HE*. <https://www.advance-he.ac.uk/news-and-views/drylabsrealscience-together-stronger> - published 18th May 2020

- 13) Francis N.J., Smith D.P. and Turner I. (2020) It's a brave new (educational) world. *Advance HE*. <https://www.advance-he.ac.uk/news-and-views/its-brave-new-educational-world> – published 8<sup>th</sup> September 2020
- 14) Stafford P., Herni D., Turner I., Smith D.P. and Francis N.J. (2020) Practical thinking in a pandemic. *The Biologist*. 65(5):24-27. <https://thebiologist.rsb.org.uk/biologist/158-biologist/features/2434-reshaping-education-practical-thinking-in-a-pandemic>
- 15) <https://www.lecturemotely.com/labcourses>

## **Presentations**

- 16) The Bioscience Education Summit 2020 – Online – What we've learnt from #DryLabsRealScience - 3<sup>rd</sup> September 2020

### **4. Exhibit innovation that has proven to improve teaching practice to enhance student learning**

*In not more than 500 words please provide evidence of how the candidate exhibits innovation in their teaching practices to enhance student learning.*

My most innovative teaching intervention, which helped me win the BSI Immunology Teaching Excellence Award 2020, has been the development of Immunology Wars, a project which aligns elements of the immune system with the characters and storylines of Star Wars. A series of short videos explain the key concepts of immunology, which are accompanied by a website with details about the different immune components and their Star Wars equivalents. I have been responsible for drawing the characters for this project, producing the videos and downloadable resources, coding the website and managing the social media outreach platforms. Student partners have been involved from the start of this project, writing whole episode scripts or contributing to website sections.

*“The videos beautifully align the principles of the immune system theory to the Star Wars universe; it is almost like the films were created for this sole purpose. I became aware of these videos last year and have included them in my own basic immunology lectures and as a resource for students to access.”*

- *Professor Ian Turner – University of Derby*

The videos have been made freely available and are widely used across courses within Swansea University Medical School and externally, with lecturers at Derby, Sheffield Hallam, Queen Mary and Sussex Universities recommending the resources to their students. The accompanying website has had over 4000 unique visits and the videos having been watched over 1200 times since November 2019, with a video on COVID-19 being featured on the BSI list of public engagement resources.

A lack of appropriate immunology teaching resources has driven me to create a range of innovative, interactive tools to inspire immunology students including a gamified “So You Think You’re an Immunologist?” revision tool based on the popular “Who Wants to Be a

Millionaire?” TV show and a novel, interactive virtual flow cytometer that has been used to replace a face-to-face workshop. A key aspect of these projects, which increases their gravitas, is the engagement of student partners in their development, at all stages from design to testing.

For the revision tool, students who have recently taken the modules were approached to help create and rank questions, some of which were generated by students currently taking the module through the use of PeerWise, a platform that allows students to write, answer and rank MCQs written by their peers. The continued use of this platform will ensure a steady supply of new questions that will allow the resource to expand year-on-year as questions are added to the question banks.

Due to increasing student numbers and current constraints on access to core research facilities, I designed a new virtual flow cytometer instrument, which allows students to interact with the different parts of the machine, appreciate the considerations of experimental design and then design their own experiment to deepen their understanding of the use of this equipment. Feedback from students has been immensely positive, with several mentioning the strong immersive, visual learning experience. All resources will be made freely available to support wider teaching.

**(500/500)**

## **References**

- 17) [Immunology Wars website](#)
- 18) [British Society of Immunology – public engagement resources](#)

## **5. Embedding inclusive approaches to bioscience teaching**

*In not more than 500 words please provide evidence of how the candidate embeds inclusive approaches to bioscience teaching, ensuring equality of participation and outcomes for those from disadvantaged backgrounds*

Completing my entire undergraduate degree and the majority of my PhD with a severe hearing impairment has made me acutely aware of the need and challenges of producing teaching resources that are accessible to all. I am a strong advocate for the principles of universal design, producing my teaching materials in multiple formats, allowing students with specific educational needs a choice of how to engage with my resources. Examples of this include access to slide decks in both PowerPoint and PDF format, allowing students to edit to their preferred colour combinations or annotate slides directly. During the switch to online, blended learning ensuring that audio and video recordings are accompanied by accurate transcripts or subtitles provides access to students with hearing impairments ensuring they can engage with my resources. More recently, I discovered these captions, which were included to ensure my teaching innovations were accessible, also supports non-deaf and hard of hearing students with their online studies, allowing

more accurate and faster notetaking.

The provision of frequent formative assessments ensures that students can keep track of their learning throughout modules and the provision of different ways for students to engage with me including Padlet and interactive discussion boards, where peer-peer interaction is encouraged and students can post in multiple formats including text, video and audio ensures that all students have a preferred mechanism of engagement. This is supported by different assessment modes within modules allowing students with different strengths to demonstrate their acquisition of knowledge including open-book quizzes, interactive laboratory worksheets with built-in, immediately actionable feedback that students can use within the current and subsequent assignments.

To provide widening access opportunities I have taught on our foundation year programmes since their inception four years ago and was instrumental in helping establish the biochemistry foundation year, providing routes into higher education for non-traditional students, as well as those in the local community from disadvantaged backgrounds. The intake each year on these programmes has been in excess of university targets, highlighting the success of these initiatives, with the first intake of students from these programmes due to graduate this year.

To aid the transition to university and allow students to gauge the standards required in HE, my innovative use of videos extends to live marking of exemplar reports that are linked to an interactive lab report writing workshop. These videos allow students to see me marking reports at different grade points in real-time, as I discuss what I am looking for and what certain marks have been awarded for. The videos catalyse the development of student assessment literacy and create inclusive assessment practice, where transparency is used to empower students and demystify assessment criteria. These screencasts have been embedded at institutional level at the University of Surrey as part of their assessment and feedback model.

*I have used Nigel's screencasts as a 'best practice' approach to exemplars, sharing the videos with several thousand staff. Many have been inspired to create similar screencasts for their students." - Dr Naomi Winstone – University of Surrey*

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## **References**

<https://www.surrey.ac.uk/sites/default/files/2020-06/dhe-focus-developing-evaluative-judgement.pdf>