

## **HE Bioscience Teacher of the Year 2019 Application Form**

### **Dr David Smith - Sheffield Hallam University**

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

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

*My practice blends research and teaching together, ensuring that my students have the best possible learning experience. I achieve this by leading on teaching initiatives that engage students in the biosciences through innovative use of objects, spaces and technology-enhanced learning (TEL). Central to this is a student centred approach to active learning within the lecture theatre. Key examples will be expanded on in coming sections.*

My core area of teaching is Biochemistry and the modules and courses that I am involved with have high student satisfaction. NSS scores for BSc Biochemistry, on which I lead core modules was 100%, 95% and 100% over the last three years. PTES results for the courses I lead are high, with MSc Biotechnology gaining 100% for the last three years and 100% for MSc Molecular and Cellular Biology within my first year of taking over. My teaching is noted by the students as being inspirational having been awarded the Sheffield Hallam student-nominated Vice Chancellors Award for Inspirational Teaching the maximum of three times, and the Faculty Inspirational Teacher prize every year between 2012 and 2017. This recognition directly from the student body demonstrates a sustained commitment to high-quality teaching with real impact. The culmination of this was in 2017 with the award of National Teaching Fellowship from the Higher Education Academy for the transformative impact I have had on students, and staff.

My research underpins the topics I teach ensuring that content is always contemporary and relevant (36 publications h-index of 22). Case studies and assessments are based around problem solving and mirror or directly address my own research problems. I have investigated the student's perception of research-informed teaching, producing guidance on good practice. Within my teaching, I not only embrace active learning methods but have developed and disseminated their use. One such example is the use of objects as a student engagement tool, where I linking structure with function within biology settings (Smith 2016). In order to understand more deeply how students interact during active learning sessions, I have undertaken pedagogical research, into how students use learning spaces. These studies highlight the importance of friendship groups and the effect on engagement, attainment and the student experience (Smith 2018). This research has led to a change in

practice into how all students can be engaged during taught sessions.

To enable student integration both in and outside the classroom, I have developed and delivered a range of TEL strategies, including lecture flipping, assessment support and the use of student response systems. My modules were described by the external examiner as "The finest example of blended learning I have ever seen." Dr John Heritage University of Leeds 2018. This work also entailed the development of discussion boards (Padlet) from inception to widespread use allowing students to contribute anonymously to learning activities in real time. Where appropriate, my screencasts that support student learning have been openly shared on YouTube and attract a large viewing audiences, with one on Enzyme Kinetics having over >134,500 hits.

**References and evidence:** E-portfolio containing evidence and links to all activities in this document can be found at the following link (<https://goo.gl/fW3cao>).

**Smith DP.** Active learning in the lecture theatre using 3D printed objects. F1000Res. 2016 Jan 13;5:61. doi: 10.12688/f1000research.7632.2. eCollection 2016.

**Smith DP,** Hoare A. and Lacey MM (2018), Who goes where? The importance of peer groups on attainment and the student use of the lecture theatre teaching space. FEBS Open Bio, 8: 1368-1378. doi:[10.1002/2211-5463.12494](https://doi.org/10.1002/2211-5463.12494)

## **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*

A major part of my teaching concerns the structural and functional aspects of biochemistry. These sessions were the context for my curriculum justification during my PGCert in Learning and Teaching. There I applied pedagogical theories to maximise the learner's ability to understand enzymology. The wider sharing in of this approach adapting it to other disciplines formed the basis of a case study for my successful Senior Fellowship of the Higher Education Academy application. The second case study involved interviewing inspirational teachers and identifying within their practice what made effective teaching. To build a firm understanding of delivering exceptional teaching at scale I have undertaken secondments at faculty level and University level LTA groups writing guidance teaching practice. To further my personal growth, I participated in a formal University mentoring and development scheme, where I was paired with an established teaching academic specially looking at object-based learning. This approach to personal development and refinement of practice challenged me to expand my perspective. I broadened my thinking and investigated how I and others could use this approach in other disciplines, deepening my own understanding of active learning theory. Following external presentations, I was encouraged and guided by Prof Graham Scott (NTF, University of Hull) to write up the method for publication. The act of writing a pedagogical publication, requiring me to learn a different vocabulary, as well as qualitative and mixed methods, approaches (Smith 2016). I have since used this new knowledge in pedagogical research to undertake research assessing how students interact with the lecture

theatre

As part of my own pathways of enquiry, I learn from the practice of colleagues across seemingly unrelated disciplines, becoming an active participant of the #LTHEchat Twitter community. I engage with colleagues at educational meetings where ideas to address similar learning situations are presented and discussed. For example, my early use of in-session MCQ quizzes as a means of assessing understanding was paper-based and the answers self-marked. This gave little indication of the areas where further support was needed. Through interaction with peers, I encountered student response systems and immediately saw the opportunity to use them. The use of these tools allowed me to see the results in real time and meant that I was able to respond to the misunderstandings of students, however, two-way interactions were still limited. The work of Simon Lancaster NTF inspired me to alter my use of these response systems using a deeper pedagogical model that incorporated iteration into the questioning and elements of peer-assisted learning. These iterations allowed students to arrive at the correct answer through conversation and gave me a deeper insight into their understanding. I now teach others through invited workshops on the use of these TEL indicatives.

Finally to enable me to be a more effective Leader in Teaching and Learning I attended "The Transition to Leadership" program run by AdvanceHE. This program has given me skills and knowledge to lead change in teaching practice, which I have implemented by the establishment of a pedagogical research group.

### **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*

Within my own department, I have acted as a mentor for new and established staff members, coaching them through the HEA fellowship applications and supporting them when embedding new methods in their teaching. To share my teaching innovations more widely, I have attended, presented and chaired LTA conferences both locally, nationally and internationally. The conference presentations have covered the use of object-based learning and the effective use of the lecture theatre teaching space. In addition have undertaken invited to run staff development workshops on the topic of student engagement, at Leeds Beckett, Hull, Staffordshire and Nottingham Universities, directly influencing the practice of Bioscience educators in those institutes.

*"David made us think about how we use the teaching space and his insight is changing the way many of us incorporate active learning techniques into traditional lecture spaces."*

*Prof Graham Scott, University of Hull*

To develop the reflective practice of bioscience students, I have contributed to the use of electronic portfolios as a means of professional development. In doing this I have presented on the technical and theoretical aspects of their use through invited presentations and written outputs for the Biochemical Society. To develop evidence-informed understanding of topics relevant to bioscience teaching, I maintain an active blog on pedagogical theory and practice

covering feedback and assessment, exams and lecture attendance. This blog has a global audience with >3135 views from 2239 visitors in 2018, with a specific interest in object-based learning. As further evidence of the impact of this blog, a recent post based around student's experience of research has resulted in an invitation to present at the RSB early career workshop in Edinburgh (2019) on integrating research and teaching. My peer-reviewed pedagogical research on student seating preference has had a global online impact within the first few weeks of publishing, being reported in 19 news outlets and gaining an Altimetric score of 192, meaning that it is in the top 5% of papers recorded (Smith 2018).

As well as my involvement with University groups, I am also a member of the Biochemical Society's Education, Training & Public Engagement Committee. This group aims to support the next generation of biochemists and provide opportunities for people of all ages to explore and discuss the issues raised by developments in molecular bioscience. In collaboration with the RSB, the group provides information and advice to Government, teaching and funding agencies, the media and all those involved in teaching biochemistry. I and two other colleagues are currently developing a training module targeted at early career academics detailing the effective use of TEL, due for delivery in spring 2019. I am also actively involved with the Society for Experimental Biology within their teaching and learning section. In this role, I have been involved with the organisation of sessions at past conferences, and am currently organising a symposium to be delivered in Dec 2018. This involves promoting the conference, collecting and organising submitted abstracts and arranging and delivering the workshops.

#### **4. Exhibit innovation that has proven to improve their 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*

A major part of my own professional development has come from the establishment of object-based learning (OBL) as an active learning tool in large group teaching, alongside the effective use of learning spaces.

**OBL** is a student-centred learning approach that uses artefacts to facilitate deep learning. Objects may take many forms, but the method typically involves students handling or working at close quarters with physical artefacts. The objects are brought into the learning environment for small group teaching or large group lectures. These objects act as multi-sensory "thinking tools" to promote learning and engagement. 3D printed models of biomolecules and artefacts used directly in my research are taken to lectures and classrooms and used to establish the link between learning and current practice. When using printed biomolecules students are required to imagine what would happen if an object is rotated or altered in a process known as "mental rotation". The information required to understand these concepts is normally presented through the use of slides and handouts which are flat 2D representations. Their use can inhibit the development of more complex cognitive mental rotations skills. Although object-based learning is an established theory, I was able to take this from a small group tutorial environment and apply it to large group bioscience lecture theatres. In addition, I have created virtual reality projections for use outside the classroom. The approach is often mentioned by students during module reviews and directly in inspirational teaching comments as being actively engaging and was objectively

assessed in (Smith 2016).

*"I never thought of the possibilities that 3D printing could offer,  
such a simple idea but an excellent teaching tool."*

*Jennifer Waby, Bradford University*

**Effective use of learning spaces.** Much of my teaching takes place in large group lecture theatres and many of the comments from the inspirational teaching awards originate in this environment. In order to increase student interactions and enhance their learning experience, I have directly investigated the reasons different students choose to sit in a given location within the lecture theatre. The study explored the personal and social factors at play within students' lecture theatre seating choice and the resulting effects on attainment. No direct correlation between student location and attainment was found. Interestingly, it was found that students physically locate into friendship groups clusters and that these clusters obtained similar levels of attainment in problem-solving tasks, with pockets of both high- and low-performing students being observed. It was also noted that isolated students performed less well than the group average. This research has led to a change in practice, with peer-to-peer activities being redesigned to break down the established groups and allow students of mixed ability to work together. Simple and usable in class interventions were employed as well as the use of anonymous student response systems to include and engage all. This has resulted in a tangible increase in attainment and first-time pass rates within challenging Biochemistry core modules; with an increase from 72% in 2015 to 87% in 2018 being seen.