Royal Society of Biology Case Study – Paul Downie

Introduction

As teachers, I believe that we must constantly evolve and develop our practice to meet the needs of the young people in our care. Throughout 2020 and now into 2021, that fundamental need for professional learning has never been so acute, with lockdown requiring a sudden and dramatic pedagogical transformation to provide learners with meaningful and accessible learning amid a global pandemic.

I will never forget my feelings of anxiety while sitting on the lab bench, reassuring those remaining pupils on that final day of school before the first lockdown. We didn't fully know what we were facing, but we were all going to be in it together. I reassured them the school would return and that in the meantime, the most important thing was to look after themselves and their family, remembering that their parents and siblings would also be finding it a worrying time. To help around the house as best they could – the little things would matter. We should all focus on what we could do. The question in my head, though, as I walked out the door that evening was, *'What was I going to do to make a difference?'*

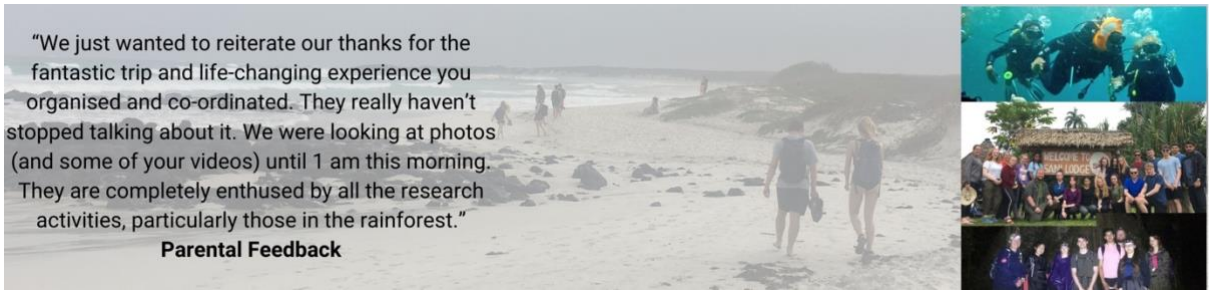
This case study aims to capture what I did to address that question during the most challenging period of my professional life and what I had previously done that led me to this point.

Pathway to Teaching Biology

My interest in living things was evident from an early age. My parents still tell the story of how at just six years old, I convinced them that my primary school teacher, Mrs McHendry, had requested that I collect and bring in frogspawn for the class. It says a lot about her, I think, that when my father appeared at the classroom door one morning with a fish tank full of frogspawn, she was willing to allow our class the opportunity to keep the tank and embrace the learning opportunities it presented (even if she had made no such request!). At the age of 14, at secondary school, our biology class was taken over by an enthusiastic newly qualified teacher Mr Giroux, who became my biology teacher for the next five years and set me on a course to study biology. At Dundee University, I was fortunate enough to come across more equally influential academics and teachers, including Prof Steve Hubbard, who provided me with the opportunity to participate in a research expedition to Trinidad in the summer of 2008 to study survival rates in tropical bird species in comparison to their temperate counterparts. It was one balmy evening sitting outside our shack in the Northern Range that I think I first began to seriously consider the prospect of becoming a Biology Teacher.

Sharing a Passion for Life

Fast forward eight years, having completed my studies and having qualified as a teacher, I was stood in front of one of my classes, discussing biodiversity, when a young person in S3 asked if we could go on a school trip to the Amazon Rainforest. Most of the class laughed. Two years later, I recalled some of these memories and experiences on another balmy night in the Sani Region of the Amazon Rainforest on an expedition I had organised for my pupils as their biology teacher. I passionately believe that it is vital that all young people understand that they can achieve whatever they set their mind to and that nothing is impossible. Our expedition to Ecuador & Galapagos not only aimed to provide students with a taster of some of the experiences I had been lucky enough to have had but also to teach them to be ambitious, and several young people who had been in the class when they laughed at the suggestion of visiting the Amazon often commented on this. The impact of this experience for the young people was significant, with a number of them now going on to study Life Sciences at university.



Given the significant costs involved in such an expedition and the diverse backgrounds of our young people in Glasgow, I spent two years ensuring no financial barriers restricted any young person with a desire to participate. I organised a wide range of fundraising activities throughout this time, which supported the expedition and allowed the school to purchase a minibus while also allowing us to leave a small legacy fund from the expedition to help school trips in the future. The minibus has made a significant impact in reducing transport costs for the school, providing transport for school trips, and playing a key role in supporting our families during recent lockdowns when used to deliver food parcels to support families in our community. These fundraising activities included a series of lectures around our school motto 'Spero Meliora', which included David Attenborough's principal cameraman Doug Allan speaking about his experiences and the danger of Climate Change to our planet. Given the efforts that had gone into making the expedition a reality and the magical experience these young people had, I was eager that they share this on their return. They were provided with a leadership opportunity to create and deliver a Biodiversity workshop about the rainforest to primary children across Glasgow. This hour-long workshop was delivered successfully to over 500 primary pupils across the city over the following months. In feedback gathered on these workshops, primary colleagues gave an average rating of 4.6/5, with 100% of staff stating that content matched with intended Second Level Es&Os, that the presentation inspired their pupils, and that the workshops had been a valuable experience for their pupils. An example of feedback is provided here:

Pupil Leadership

The leadership opportunity that I provided these young people with following the expedition inspired me to develop this further and ensure that our senior pupils continued to have similar opportunities to enrich the learning of younger pupils, especially with regards to science and Biology. This work has continued and now involves a Primary 7 Enhanced Transition Science Club to complement the work done by my colleague Kate Samuel. Before lockdown, this ran over a number of weeks, including a parental showcase where younger primary pupils could share some of the practical work with parents visiting the Science Department at high school. A colleague from one of our partner primary's offered the following feedback:

I have also had senior pupils working with a local nursery to provide STEM activities for children to get them excited about science and STEM education from an early age. One colleague from a participating nursery offered the following comment:

'The parental feedback has been good, and it seems that the children talked about the session quite a lot when they got home. The children really enjoyed meeting your pupils, and I think they will be delighted to see you all again.'
Gillian Robertson, Headstart Nursery

Royal Society of Biology Case Study – Paul Downie

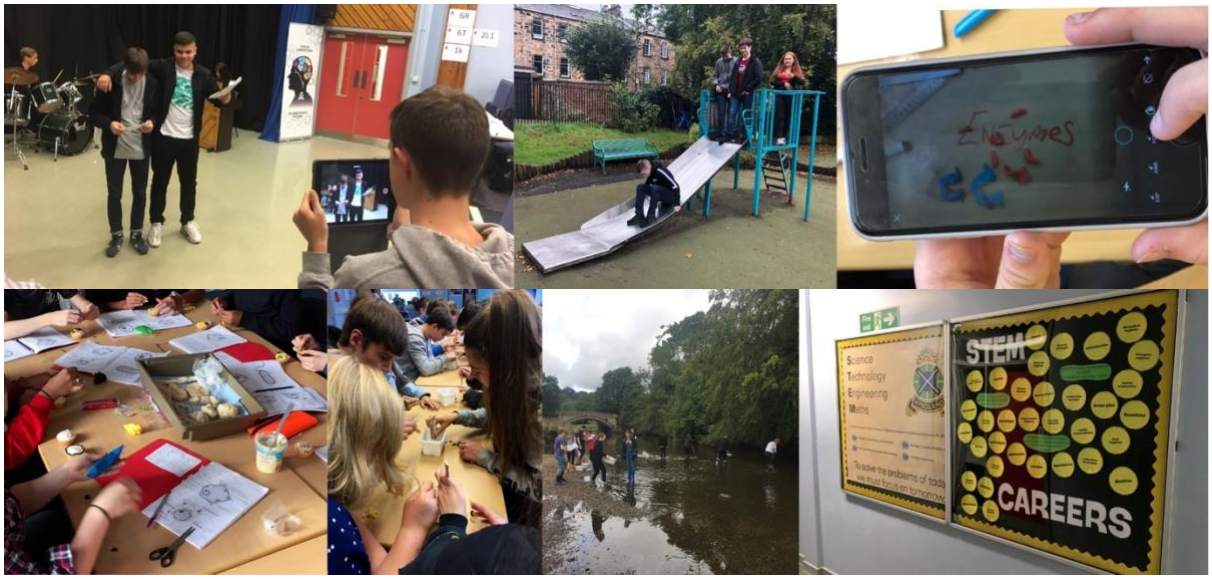
Three of our senior pupils involved in this work participated in the National Youth Steering Group, helping to develop the Young STEM Leader Award.

Every Day is a School Day

I also became involved in the Young STEM Leader Award Steering Group, as we became a pilot school for the award, which proved to be a valuable CLPL opportunity. As a reflective practitioner, I am constantly seeking opportunities to develop my professional knowledge and skills. This has involved Improving Gender Balance Training through the Institute of Physics and regularly attending STEM Teachmeets and Secondary Science Meetings, many of which are organised by the STEM Glasgow Team who do fantastic work across Glasgow and beyond. I have been awarded Professional Recognition from the General Teaching Council for Scotland for Leadership in Science, following two residential CLPL courses organised by SSERC and completing associated Gap Tasks.

Bringing the Classroom to Life

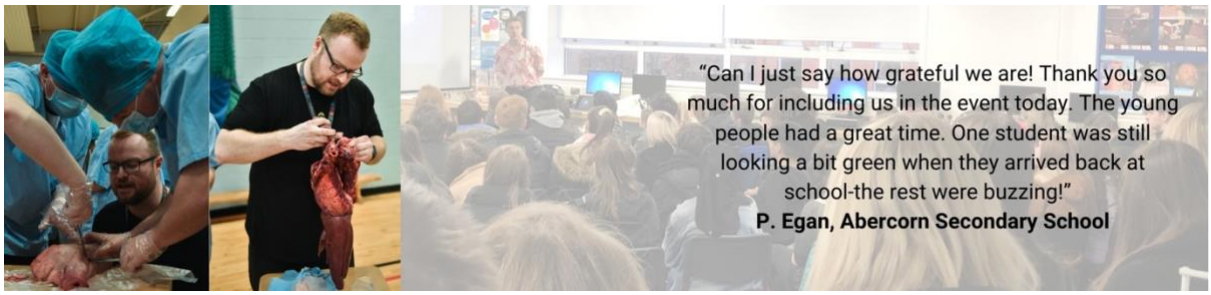
I am passionate about getting young people out of the classroom and finding learning opportunities in the local community, whether doing fieldwork in local parks, PCR workshops at Glasgow University, or utilising slides in the local playpark to explain concentration gradients. I also understand that you do not need to take young people to Galapagos to effectively teach them about Darwin's Finches and Evolution and utilise activities such as 'beaks and beads' in adaptation lessons which pupils find engaging and enjoyable. I use cake decorating to help reinforce cell structures by getting pupils to make 'Cell Cakes' and also enjoy providing learners with creative opportunities through creating songs, raps or video presentations of their learning. Facilitating structured class debates around ethical issues such as Stem Cell Research offers young people a chance to consider their views and views of others. Activities such as these debates allow an opportunity for cross disciplinary learning, providing a way of learning about biology while understanding its social, political and ethical contexts. I embrace opportunities for practical work to support and deepen learning while developing scientific and experimental skills. With senior students, particularly within my Higher classes, I have encouraged wider reading and actively encouraged this by lending personal copies of books such as My Beautiful Genome, The Immortal Life of Henrietta Lacks, Genomics and Personalized Medicine, and The Making of the Fittest.

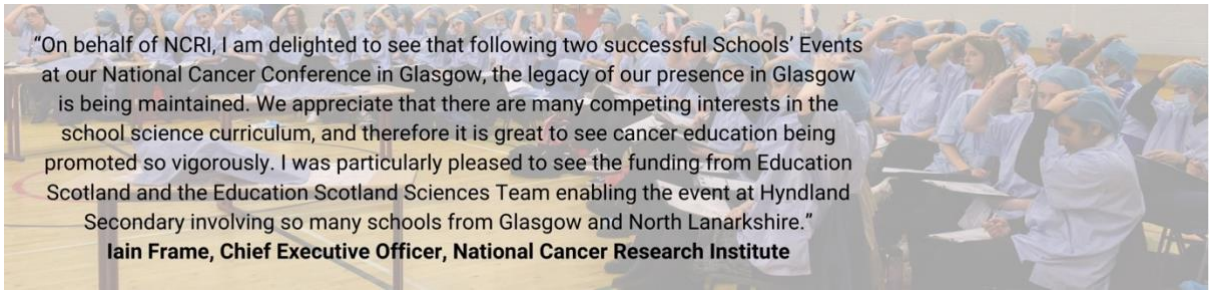


In the increasingly complex world in which we live, I believe that it is essential that learners can transfer their knowledge and learning from one context to another and understand how different aspects of our world interconnect. Weaving real-world examples into lessons and highlighting associated careers and pathways plays a part in this. Career wall displays are used, and updating our science website to include links to career information. This passion for making learning relevant for learners was a big driver for becoming involved in the National Cancer Research Institute Conference Schools Event. I was invited to sit on the NCRI Schools event

planning group alongside colleagues from NCRI, Prostate Cancer UK and Oxford University to help organise the event programme, highlighting the diversity, differences and similarities of cancer research professionals. I also organised the associated film competition for schools in partnership with Twig Education and Imperial College London. Schools submitted pupil entries ahead of the event, where participants voted for the winning video from a shortlist of successful entries. A group of pupils from John Paul Academy were subsequently presented with an award by the Chief Executive of NCRI.

Motivated by my involvement in the NCRI Conference Schools Programme, I successfully applied for funding from Education Scotland's STEM Grants Programme. My aim was to improve pupil and staff knowledge and understanding of anatomy and dissection, while increasing awareness of the importance of cancer education within the context of biology. This included creating a short term staff working group tasked with developing a unit of BGE Biology on Cell Biology and Cancer Education. A special 'Learning Together' event brought together 80 pupils and 12 staff from 4 local authorities, with pupils and staff benefitting from input on STEM careers within Cancer Research and related fields from the team at the Beatson Institute before participating in an award-winning anatomy and dissection workshop. Staff had a working lunch to plan the development of a BGE unit, and the collaborative event was met with lots of positivity from all stakeholders. The event was opened with a welcome message from the Deputy First Minister, John Swinney, focussing on the importance of STEM subjects in tackling cancer, which impacts so many of us. Young STEM Leaders helped organise and plan the event, helping to run the registration desk before participating. Pupils represented 12 schools and a range of abilities from N4 Science through to Advanced Higher Biology. They included young people with additional support needs from Abercorn Secondary School who could fully participate in the event, which was fully inclusive and open to all. Staff impact surveys from the event showed increased confidence in teaching cancer-related topics, increased confidence in doing anatomical dissection work and increased resources to teach related topics. Qualitative feedback from the event are presented below:





The second phase of this work was paused due to COVID-19, and Education Scotland provided an opportunity to redirect a small amount of remaining funding to help start The Higher Biology Podcast as part of the response to remote learning brought about by lockdown.

Promoting Science Across the School

My passion for promoting science and enthusing young people can also be evidenced by Hyndland Secondary School becoming one of the first in Scotland to receive the STEM Nation Award in full, which I lead through a rigorous validation process in the following five elements; Leadership in STEM; STEM Family Learning; Employability and STEM Partnership Working; STEM Curriculum and Learner Pathways, Equity and Equality in STEM. This achievement, awarded in September 2020, is evident in my contribution to the development of science throughout the school and the vibrant activities and high-quality extra-curricular learning

opportunities that exist to inspire students beyond the classroom across the school. Part of this work involved the development of a STEM core period. My vision was that it should be more than just a topical science unit and enhance the experience of learners as they become informed and responsible citizens by making explicit connections with other school priorities and initiatives. Young people were surveyed to ensure their curricular focus was based on their interests. As a Rights Respecting School, the course was designed in such a way to focus on some articles from the UNCRC while delivering several science, literacy and numeracy outcomes around the current global challenges of climate change. This cross-disciplinary approach humanised many of the issues around these topics, helping to engage more young people by putting science in a real world context.

I actively promote science to pupils and parents by presenting at assemblies and parental information evenings, particularly when young people are making subject choices or critical transition periods. My commitment to supporting young people in their studies is further evidenced by facilitating supported study sessions and attending some Saturday Morning Study Sessions and Residential Study Sessions offered by the school.

Digital Technology to Support Learning

Throughout my teaching career, I have looked to use digital technology to enhance the learning experience for young people and ultimately help in raising attainment. I have used technology in a wide range of ways in the classroom. For example, having pupils use stop motion animation when learning about enzyme action or mitosis and videos to enhance practical techniques and revision. In 2016 I delivered a 50-minute seminar at the Scottish Learning Festival on 'Getting Smarter With Smartphones in Science' and continued developing how I use technology in my teaching. This proved invaluable over the past 12 months during COVID 19, when remote and blended learning relied on technology. Over recent years, I have worked alongside colleagues to ensure that our Science @ Hyndland website offered a fully comprehensive online revision site for young people studying science. This was further developed over the past two years to include 10-week revision plans for National 5 and Higher Biology in the form of hyperlinked documents breaking courses down into manageable chunks across a set amount of time, linking directly to revision materials.

Lockdown Learning

In January 2020, all teachers and young people in Hyndland Secondary School received an iPad as part of the biggest Apple Education project in Europe in the form of Glasgow City Council's Connected Learning and Digital Strategy. Little did we know at the time, but these were imminently about to become our core learning tool in the months ahead. In March 2020, schools across the country moved to online learning as we entered the first national Covid 19 Lockdown.

During the first few days of the lockdown, I was invited to contribute towards a new Pupil Remote Learning Site for young people across Glasgow as one of 5 contributors to science. We were initially tasked with each populating our area with one or two innovative learning experiences. As part of this work, I created a task where learners could study animal behaviour from their own home. This included understanding the term Ethology and its importance while providing an ethogram to complete having observed their pet or a panda using the panda cam at Edinburgh Zoo.

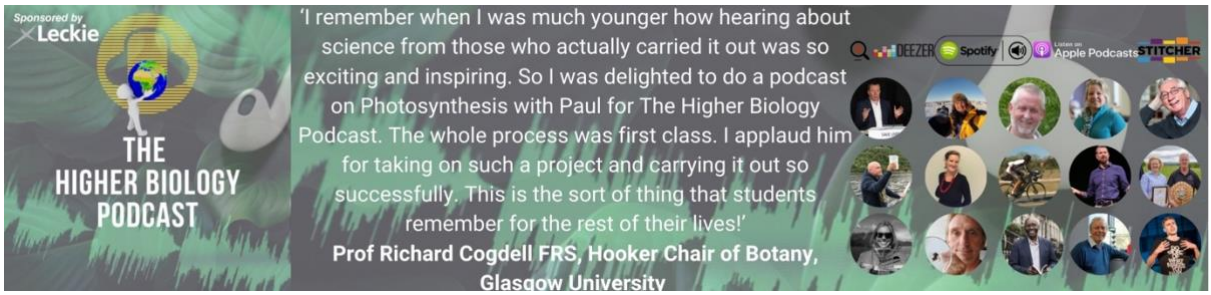
The early days of remote learning were a steep learning curve for us all as we adapted to online teaching. Using apps such as Showbie allowed for enhanced feedback on pupil work in voice notes and marking directly onto pupil submissions that they uploaded onto the app from their jotter as images.

At the end of March, I carried out an audit of all PPE within the Science Department alongside our technician Diane Bell before boxing up suitable materials made available for front line staff when there were severe national concerns around PPE shortages. I was on the school rota for working with key worker/vulnerable pupils and a separate rota for supporting efforts in delivering food parcels to families in the community who required support.

To support transition at a time when pupils were learning from home, I recorded a virtual tour of the school with Laura Forrester, our Depute Head Teacher, which received over 1000 views. Our online based tracking

and monitoring system, Hyndland Elements, which was created using Powerapps by my colleague Dr Gary Smith allowed myself (as Faculty Head (jobshare)) and my colleagues in the Science Faculty to feel greater confidence in assigning student grades following the cancellation of the exam diet. My Faculty Head Job share, Debbie Toal, and I felt immense pride at how our faculty rose to the challenges together. Much of what I have evidenced within this case study was possible because of the fantastic colleagues surrounding me, who I have the privilege of learning from. Much of our development work in recent years around how to use digital technology to enhance learning and teaching but also to improve our administration as a Faculty paid off in a significant way as education was forced to move online in such drastic fashion, and we have continued to learn and improve as a result of it.

Within my classroom, I like to tell stories and moving to online teaching made this problematic. My wife and I listen to a lot of podcasts, and around April 2020, I began to wonder if it might be possible to create something to allow me to tell some of these stories. The Higher Biology Podcast pilot episode was published on May 2nd 2020, with myself and Prof Dave Goulson from the University of Sussex discussing various aspects of biodiversity. The podcast aimed to give young people access to experts from across the globe, offering depth and insight for students preparing for the SQA Higher Biology qualification while also providing a fascinating insight into the world around us for anyone interested in living things. With 15 episodes published to date and thousands of downloads across the UK and more from 65 countries across the planet, what started as an ambition to enhance online learning during that first COVID lockdown for my class, has far surpassed original expectations. The Podcast has been featured as an example of Interesting Practice by Enterprising Schools and is also now being broadcast across the UK via Paul Dix and his new TeacherHug Radio platform. Guests on the podcast so far have, amongst others, included leading primatologist Frans de Waal, Chief Veterinary Officer; Sheila Voas, Scotland's first black professor Sir Geoff Palmer, round the world cyclist Mark Beaumont, author Jonathan Drori, Prof Ray Owens from Oxford University, past president of the International Society for Photosynthesis Research Prof Richard Cogdell and even Prof Neil Gemmell from New Zealand discussing how he used eDNA techniques to search for the Loch Ness Monster! Feedback from one contributor was as follows:



The podcast has also provided a platform to share up to date information on Coronavirus and the impact on young people and schools. National Clinical Director for Scotland, Prof Jason Leitch, has appeared on the podcast three times over the past year providing updates and sharing his journey from the Biology classroom at Airdrie Academy to advising the First Minister and the Nation during a global pandemic.

Having allowed remaining funding from my work on cell biology and cancer education to be redirected, following the COVID19 lockdown, towards supporting learning at home, Education Scotland continue to support the Podcast.

'Education Scotland's STEM Grants Programme was designed to release the tremendous creativity, initiative and potential of Scotland's practitioners and to promote leadership and collaboration. We're inspired with the approach that Paul has taken and hope others are too. The Podcast Series exemplifies beautifully how we can adapt, in a time of education recovery, to develop new online approaches to learning and teaching to inspire learners.'
Ian Menzies, Senior Education Officer for STEM, Education Scotland

Alongside the support from Education Scotland, the podcast has also partnered with YoungScot, with young people across Scotland able to claim 100 YoungScot Reward Points for each episode of the podcast they listen to. Leckie Scotland has kindly sponsored the podcast to ensure I had access to suitable equipment to produce

the podcast in a sustainable manner and have offered significant assistance and enthusiasm to continue moving the podcast forward. The following comment was received from Leckie Scotland:

'Paul's compelling podcasts are a fantastic way to connect with Biology in the world around us. All of us at Leckie are delighted to support Paul's venture in exciting curiosity across an inspiring range of contexts.'
Sarah Mitchell, Head of Teacher Channel and Partnerships, Harper Collins Publishers

My colleague Kathleen McManus and I worked together during the first lockdown to pull together an asynchronous remote learning package for Higher Biology pupils, including a key area note (Focus on Knowledge), a key area podcast (Focus on understanding/context/DYW/subject depth), a diagnostic assessment (MS Forms/Socrative), recorded worked example videos to support feedback to diagnostic assessments and research tasks & extended response questions. We chose this asynchronous approach during the first lockdown as they allowed greater flexibility for 'pace' and 'path' of learning and removed 'time' and 'place' barriers. During the first lockdown, there had also been some concern from professional associations around the use of 'live online sessions'; however, as the advice and understanding of these approaches has developed, colleagues have also successfully used Microsoft Teams to incorporate this during the second national lockdown.

We were asked to share this work at a number of Regional and National online professional learning events in early June. One of these National events hosted by Education Scotland focussed on Senior Phase Sciences, where Martyn Crawshaw from Millburn Academy shared work that he had done alongside his colleagues at the Institute of Physics to produce an impressive google sheet to collate resources shared by colleagues across the country. Martyn kindly shared the template to this sheet which I edited and began to share with biology colleagues, attempting to replicate something similar for our subject. Education Scotland ultimately adopted this approach as part of the 'Supported' element of the National e-Learning Offer. At that point, I passed on ownership of the Biology resource sheet, which has since been adapted into an Excel Version. The IOP sheet is available through this National Offer; however, they maintained control of developing their resource and continue to do excellent work for their subject.

From sharing my work at another regional event, I was approached by John Stuart of the Regional Improvement Collaborative. Key aims of the West Partnership are to empower practitioners and shift the ownership of change. There was interest in using my work to illustrate the potential dialogue about how we could further support learners and teachers working remotely. From these early discussions, the West Partnership Online School developed. This has been one of the most powerful examples of collaboration I have had the privilege to be involved in throughout my teaching career. As it is now called, West OS is an online school created by teachers, providing recorded learning experiences for children and young people. We believe that all children and young people should be able to access high-quality learning experiences regardless of circumstances and believe that the principles of high-quality learning and teaching should be reflected in our recorded learning experiences. West OS has become the 'Recorded' element of the National e-Learning Offer and is now accessible to every learner and teacher in Scotland. With more lessons being added each day, there are currently over 1650 lessons online, including a wide range of Biology lessons covering N4, N5, Higher and Advanced Higher. Having worked throughout summer 2020 on the early development of West OS with our core West Partnership team, I continued in my coordinator role through a part-time secondment role from August 2020. As we entered a second national lockdown, my secondment was extended to allow me to assist in developing this resource to support learners and teachers across Scotland. Part of this work throughout March 2021 has involved creating 'Sustainable Scotland' alongside colleagues from eSgoil who deliver the 'Live' element of the National e-Learning Offer. 'Sustainable Scotland' is a programme of both live and recorded lessons designed in partnership between West OS, eSgoil, Education Scotland and Keep Scotland Beautiful based around Learning for Sustainability and the United Nations Sustainable Development Goals. We have had positive reports of young people engaging with the 'Sustainable Scotland' programme, which has demonstrated the strength and collaborative nature of the overall National e-Learning Offer. The materials produced will be available beyond March through the West OS platform as we look towards COP26. When I hope that more young people, schools and communities will be engaging with the issues the conference will address and that these resources will help bring the concepts to life for learners. Feedback from a HeadTeacher planning on using this resource is shared below:

Conclusion

This case study has allowed me the opportunity to consider *'What did I do to make a difference?'*

The answer is simply that I did what I could.

I have been fortunate to be surrounded and supported by a wide range of colleagues who have all equally deserved any award I may receive, and nothing that has been outlined in this case study would have been possible without them.

What I have learned is that during the most challenging time of my teaching career, teachers worked together to do the very best they could for their learners and that we have learned a great deal that can continue to improve learning and teaching in the future. For me, COVID 19 has meant working in front of a computer screen more and temporarily stepping out of the classroom. Still, it has provided an opportunity to work closely with and learn from inspirational colleagues right across the country.
I am looking forward to taking these experiences back into the classroom and cherishing the small moments that offer excellent learning opportunities in biology, whether that is the excitement of a bee flying through the window or an enthusiastic wee boy arriving at the classroom door with a tank of frog spawn.

You can follow @Mr_Downie on Twitter should you be interested in his approaches to teaching biology.