
Practice case study

The Life Sciences Challenge: delivering an all-Wales bilingual inter-school competition for over 10 years and throughout a global pandemic

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Submission date: 14 July 2023; Acceptance date: 24 September 2024; Publication date: 10 December 2024

How to cite

Hatch, S., Edwards, K., Watson, A. and Matthews, J. (2024) 'The Life Sciences Challenge: delivering an all-Wales bilingual inter-school competition for over 10 years and throughout a global pandemic'. *Research for All*, 8 (1), 10. DOI: <https://doi.org/10.14324/RFA.08.1.10>.

Peer review

This article has been peer-reviewed through the journal's standard double-anonymous peer-review process, where both the reviewers and authors are anonymised during review.

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Open access

Research for All is a peer-reviewed open-access journal.

Abstract

The Life Sciences Challenge/Her Gwyddorau Bywyd is an all-Wales bilingual inter-school competition for Year 10 pupils, designed and delivered by students, staff scientists and engagement professionals within Cardiff University School of Medicine. The fun, interactive and challenging quiz was created to share an enthusiasm for understanding the natural world, and to inspire pupils to consider the extensive possibilities of future careers involving science. It is one of a suite of school engagement initiatives within the highly successful centrally coordinated Science in Health programme, established in 1994. Now in its 12th consecutive year, the Life Sciences Challenge/Her Gwyddorau Bywyd has evolved considerably, and it continues to attract participation from a growing number of schools across Wales. In this article, we: (1) explore the evolution of the Life Sciences Challenge/Her Gwyddorau Bywyd between 2013 and 2022, and how it swiftly adapted and responded to the Covid-19 pandemic, ensuring no interruption in delivery; (2) present data evidencing the impact of the Life Sciences

Challenge/Her Gwyddorau Bywyd on our key stakeholders: participating Year 10 pupils, teachers and Cardiff University students; and (3) highlight lessons learnt, to improve the impact of a science/research outreach activity to relevant audiences, researchers, public engagement professionals and any organisation with a public engagement agenda aimed at schools.

Keywords bilingual; education; public engagement with research; science engagement; STEM; outreach

Key messages

- To maintain the continued growth and sustainability that the Life Sciences Challenge/Her Gwyddorau Bywyd has achieved requires input from a multidisciplinary team of researchers, students and engagement professionals. The involvement of a new cohort of PhD students every year ensures that the Life Sciences Challenge/Her Gwyddorau Bywyd remains fresh, creative, innovative, scientifically challenging and, most importantly, fun.
- The introduction of an online preliminary round has enabled the participation and engagement of schools across the whole of Wales.
- Offering the quiz bilingually has set it apart from other initiatives, and has supported successful engagement with over 70 per cent of Welsh-medium/bilingual schools in Wales.

Introduction

Engaging young people with science, technology, engineering and mathematics (STEM) has long been a priority for universities (Archer Ker et al., 2013), fuelled by a STEM skills shortage reported over many decades (Smith and White, 2019). The Cardiff University School of Medicine Science in Health (SiH; <https://www.cardiff.ac.uk/scienceinhealth>) programme was developed to engage young people in the health sciences, and to present the breadth of career opportunities that science in health can offer. The programme in its entirety aims to complement and expand on the school science curriculum by challenging students to research beyond the curriculum boundaries, offering hands-on practical activities, informing university and career choices, and demonstrating the applicability, transferability and impact that science has on everyday life.

The Life Sciences Challenge/Her Gwyddorau Bywyd (LSC/HGB) initiative was conceived in 2013. Early career researchers (ECRs), alongside non-clinical staff and PhD students in the School of Medicine, observed that following engagement activities with school students, there was a strong sense of career aspiration bias towards clinical training, as opposed to academic and research-based science career paths (Figure 1).

Delivery of the first LSC/HGB


The LSC/HGB took shape as a head-to-head knockout-style format, like the BBC television quiz *University Challenge*. A flyer advertising the initiative was sent to known local teacher contacts, and disseminated utilising the teacher networks of STEM Learning (<https://www.stem.org.uk/>) and See Science (<https://www.see-science.co.uk/>). In total, 12 schools (8 English and 4 Welsh), involving Year 10 pupils from the Cardiff area took part.

Volunteers made up of PhD students, early career researchers and members of academic staff from across the university designed the quiz and set the questions for each round. The diverse training of volunteers meant that the range of questions was wide, and thus truly reflective of the life sciences.

Figure 1. Illustration of the original aims of the LSC/HGB, using original branding

Life Sciences Challenge 2013

Aims of the project



- Highlight the non-clinical career options available to pupils with ‘a passion for Science.’
- Provide an opportunity for year 10 pupils to meet young scientists in a fun and informal setting before they make their further and higher education choices.
- Demonstrate that STEM careers are a real, achievable and accessible option.
- Stimulate interest in the Life Sciences beyond the taught curriculum, and thus help prepare interested students for further study later in their careers.
- Complement activity at higher-level Chemical and Biological Olympiads, taking place in some schools, which are written exams for A-level students run by the respective Royal Societies. A different quiz format and target age group will mean no overlap between these established competitions and the LSC/HGB quiz.

Initial rounds of the quiz were hosted in schools in early May and at the end of July to avoid examination periods. Each school was attended by a minimum of two scientists who would undertake the roles of quizmaster and scoremaster. Attending facilitators would introduce themselves, briefly describing their schooling choices, career path, their research and its importance in the field of science in health.

Bilingual quiz finals were held on the same day in September, providing the now Year 11 pupils with often a first opportunity to experience university facilities. Pupils’ families and peers were invited to support the finalists, and an exhibition of science posters and a tour of research facilities provided visitors with the opportunity to find out about current research.

Overwhelming positive feedback received resulted in the LSC/HGB becoming a component of the SiH programme. This not only avoided the quiz becoming an ‘one-off’ engagement event (Archer et al., 2021); it also ensured its continued delivery and development by the School of Medicine’s Patient and Public Involvement and Engagement (PPIE) team.

Evolution of the LSC/HGB

The quiz has evolved extensively over the period, as highlighted in Figure 2. Since 2015, a new cohort of PhD students has been recruited during each October induction week to compile new and fresh questions, and to deliver the quiz rounds with the support of the core team.

The LSC/HGB now engages with schools from across the whole of Wales, following the introduction of an online preliminary round utilising a specialised quiz platform, Flexiquiz (<https://www.flexiquiz.com/>). All communications with schoolteachers are managed utilising an established database of science teacher contacts developed to promote all SiH initiatives.

The outbreak of the Covid-19 pandemic in March 2020 meant that the ‘live’ rounds could no longer take place in host schools or on campus. The team quickly adapted to the online running of these rounds, using either Zoom or Microsoft Teams. Key elements of the in-person events were transferred to the virtual

Figure 2. Timeline highlighting notable milestones in the evolution of the LSC/HGB between 2013 and 2022



delivery, including the introduction and career backgrounds of students and members of staff facilitating the LSC/HGB. The use of physical buzzers was replaced by a free online buzzer system called BuzzIn Live (<https://buzzin.live/>). Despite the challenges of school closures during the pandemic, schools and their pupils continued to engage with the LSC/HGB. In 2022, a hybrid model of the quiz was delivered, with the quarter- and semi-final rounds held online, and the finals held in person, on campus. This model continues to be in operation today.

The content of the LSC/HGB

The quiz aims to stimulate interest and inquisitiveness about all areas of life science for Year 10 pupils. Quiz questions are based on the taught sciences (biology, chemistry and physics) and mathematics curricula, but they aim to challenge and stretch pupils' knowledge and imagination further, and therefore to reward those who conduct research outside the classroom. Importantly, the quiz is also designed not only to test knowledge recall, but also to probe the ability of pupils to analyse data, interpret a range of graphical formats and to think laterally, essentially, recognising teamwork and rewarding pupils with the skills that scientists require in their daily work.

Quiz questions are largely created in English and, since conception, an expert translator of scientific terms has been employed to translate each of the quiz rounds. Translations are further checked by first-language Welsh speakers working in the sciences to ensure authenticity.

Scientific content

The preliminary online round is mainly made up of multiple-choice questions in a range of formats, and some open-ended questions (see [Figure 3](#)).

The quiz quarters, semis and finals are normally made up of seven different rounds (see [Figure 4](#)).

Evaluation strategy of the LSC/HGB


From conception, the LSC/HGB has adopted a common standard for the evaluation of its design, delivery and impact ([Reed et al., 2018](#)), utilising several different feedback methods (paper forms; Mentimeter, Google Forms). However, it is widely acknowledged that evidencing the impact of public engagement initiatives in general is challenging ([Hopkins et al., 2021](#), [Ravenscroft et al., 2017](#)). Here, tracking student A-level and degree choices would potentially provide some indication of the impact of the LSC/HGB. Nevertheless, quantifying the level of influence of a public engagement activity over a year before A-level choices is difficult, as is tracking student choices and post-16 destinations.

Quantitative impact of the LSC/HGB

[Table 1](#) summarises the number of schools, pupils, and university staff and students involved in the LSC/HGB over the course of the 10-year period. In total, 106 schools have participated in the quiz, representing 58 per cent of secondary schools in Wales. In addition, 4,200 pupils have engaged with the quiz, and a total of 85 personnel have been involved in its design and delivery since conception.

The number of schools participating in the LSC/HGB was growing year on year, reaching 67 schools when the pandemic hit in 2020. Since 2021, the number of participating schools has dropped to between 40 and 50; however, the number of pupils and teams participating from each school is higher than in all years prior to 2020.

Figure 3. Examples of online preliminary round questions



Life Science Challenge Preliminary Round: Types of Questions

Her Gwyddorau Bywyd Rownd Ragarweiniol: Mathau o Gwestiynau

Welcome to the LSC Preliminary Round!

- The quiz comprises of 20 questions (each with multiple elements) and a total of 100 marks and you have 20 mins to complete it.
- You may answer the questions in any order using the 'Next Question' and 'Previous Question' buttons and can leave answers blank as necessary.
- Once 20 mins are up, the quiz will automatically be submitted with the answers you have provided.
- Teams will be ranked by score and subsequently time if required.

Good Luck!

Croeso i Rownd Ragarweiniol HGB!

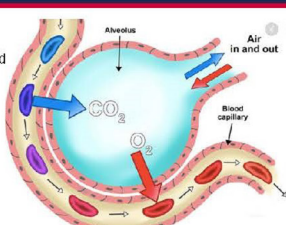
- Mae'r cwis yn cynnwys 20 cwestiwn (pob un ag elfennau lluosog) (100 marc) ac fe gewch 20 munud i'w offren.
- Gallwch ateb y cwestiynau mewn unrhyw drefn gan ddefnyddio'r botymau 'Cwestiwn Nesaf' a 'Cwestiwn Blaenorol' neu eu gadael heb eu hateb os oes rhaid.
- Unwaith y bydd 20 munud i fyny, bydd y cwis yn cael ei gyflwyno'n awtomatig gyda'r atebion rydych chi wedi'u darparu.
- Os bydd timau yn sgorio'n gyfartal, y tim gyda'r amser cyflymaf bydd yn ennill.

Pob Lluc!

Question | Cwestiwn 1

We need to get oxygen from the air into the blood and we also need to remove carbon dioxide from the blood into the air. This is known as gas exchange. The movement of these molecules through gas exchange in the lungs occurs by which process?

- Active transport
- Diffusion**
- Transpiration
- Perspiration
- Respiration
- Osmosis



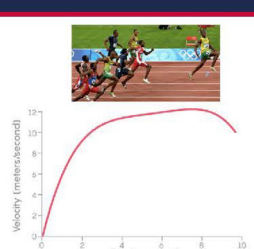
Rydym angen ocsigen o'r awyr i mewn i'r gwaed ac rydym hefyd angen gwaredu carbon deuocsid o'r gwaed i'r awyr. Yr enw ar hyn yw cyfnewidiad rwyol. Mae'r moleculau hyn yn symud trwy gyfnewidiad rwyol yn yr ysgyfaint trwy ba broses?

- Teithio llesol
- Trylediad**
- Trydarthiad
- Chwysiad
- Resbiradiad
- Osmosis

Question | Cwestiwn 2

Velocity and acceleration

- At what time point did Usain Bolt reach his maximum speed in the race? **8 seconds**
- What was Bolt's acceleration over the first two seconds? **Acceleration = change in velocity/time = 6-0/2 = 3m/s²**
- What approximate distance did Bolt cover between 6 and 8 seconds into his race? **24 metres**



Buanedd a chyflymu

- Ar ba bwynt gyrhaeddodd Usain Bolt ei gyflymder uchaf yn y ras? **8 eiliad**
- Beth oedd cyflymder Bolt dros y ddwy eiliad gyntaf? **Cyflymu = newid mewn buanedd/amser = 6-0/2 = 3m/s²**
- Beth oedd y pellter bras (mewn metrau) deithiodd Bolt rhwng 6 ac 8 eiliad gyntaf y ras? **24 metr**


Question | Cwestiwn 3


All substances have a pH value. Can you order these six objects into their pH order with the most acidic as number 1 and the most alkali as number 6.


The order on screen does not correspond with their pH order. 0.5 mark for each correct answer.


Mae gan bob sylwedd werth pH. Allwch chi osod y chwe gwrthrych yma yn eu trefn pH gyda'r mwyaf asidaidd yn rhif 1 a'r mwyaf alcali yn rhif 6.


Nid yw'r drefn ar y sgrin yn cyfateb i'w trefn pH. 0.5 marc am bob ateb cywir.


 a) Bleach/Cannydd


 b) Battery/Batri

 c) Egg White/ Gwyn wy

 d) Lemon/Lemwn

 e) Soap/ Sebon

 f) Coffee/Coffi



Answers/Atebion: 1. Battery/Batri 2. Lemon/Lemwn 3. Coffee/Coffi 4. Eggs/Gwyn wy 5. Soap/ Sebon 6. Bleach/ Cannydd

END OF QUIZ

Thank you for taking part in the Life Sciences Challenge quiz
Quarter-finalists will be notified by the end of March

DIWEDD Y CWIS

Diolch am gymryd rhan yng nghwis Her Gwyddorau Bywyd
Bydd timau sy'n cyrraedd rownd yr wyth olaf yn cael eu hysbysu erbyn diwedd mis Mawrth

Figure 4. Different types of rounds utilised in the LSC/HGB



Life Science Challenge Types of Rounds

General Science: Questions testing general science knowledge but with an emphasis on 'why' style reasoning questions rather than 'what' style knowledge recall questions.

Elementary: Names of musical artists spelt with symbols of elements found in periodic table with a follow-up maths and chemistry based question.

Who Am I?: Given three clues and need to identify scientist.

What Am I?: Given three clues and need to identify scientific object or phenomenon.

'Who, What, When': Matching individuals, what they did and dates.

Quickfire: Name chemicals from formulae, chemical hazard symbols, properties of light, inflammations of different organs and tissues.

Data Analysis: Provide a piece of data to analyse.

Connections: Finding connections between images.

Skeletons: Identifying animal from zoomed-out images of bones.

Taxonomy: Which organisms are on the same taxonomic level?

Pointless: Identifying correct but also most obscure answer.

Conundrum: Anagrams of scientific words.

Anatomy: Identifying organs and tissues from scans.

Science Connect 4: Organise 16 clues into four groups of connected items.

Codebreaker: Use of universal genetic code to crack codes that spell science terms or names of scientists.

Beat That: Category provided and teams take it in turns to provide answers (e.g. colours of rainbow).

Scientific Pictionary: Guess scientific word from image (FINAL).

Real or Fake: Determine whether statements are false or real.

Zoom Out: Identifying images of animals as image zooms out.

Jigsaw: Removal of pieces of jigsaw gradually reveals image behind with follow-up question.

Scientific Odd One Out: Identify odd item from list and why.

Scientific Catchphrase: Provided with two or more images and required to identify the scientific term that relates to images.

Scientific Anagrams: Identify scientific term.

Codebreaker

Instructions

- This is a buzzer round.
- To generate proteins, anti-sense DNA is transcribed to make RNA which is then translated into proteins comprising amino acids.
- We will provide you with a DNA anti-sense sequence which you must first transcribe into RNA, then translate into amino acids using the provided codon usage chart. Each amino acid has a distinct letter code. For example, glycine is the letter G.
- Note that Uracil in RNA pairs with Adenine in DNA, Adenine in RNA pairs with Thymine in DNA (and Guanine in RNA pairs with Cytosine in DNA and Cytosine in RNA pairs with Guanine in DNA).
- First team to answer correctly gets 3 points.

Question 1

Code 1

AGGGGGCTTCTTCTA

RNA	DNA
U	- A
A	- T
G	- C
C	- G

Answer

Code 1

AGGGGGCTTCTTCTA
UCCCCCGAAGAAGAU


S P E E D

Elementary

Instructions

- This is a buzzer round.
- A short song-bite will be played and the artist name will be revealed after 10 to 20 seconds.
- Please provide the full name of the chemical elements from the symbols that spell out the artist/band name.
- Bonus Calculation and Chemistry-related questions will follow identification of artist and will be open to both teams.

Question 1




Solange

Answer

S O La N Ge

S	Sodium
O	Oxygen
La	Lanthanum
N	Nitrogen
Ge	Germanium

Table 1. Schools' engagement in the LSC/HGB over 10-year period 2013–22

Year	Number of participating schools		Number of participating teams		Number of students		Number of staff involved in delivery				Winning teams		
	English	Welsh	English	Welsh	English	Welsh	PhD	ECR	Academic staff	Medical student	Admin	English	Welsh
2013	8	4	8	4	32	16	6	10	6	-	-	Whitchurch High School	Ysgol Gyfun Bryntawe
2014	19	7	19	7	76	28	6	1	1	-	1	Whitchurch High School	Ysgol Gyfun Gwynllyw
2015	17	9	32	10	128	40	8	3	2	-	1	Dyffryn Taf School	Ysgol Plasnewydd
2016	17	12	37	21	148	84	8	1	3	-	1	Whitchurch High School	Ysgol Y Preseli
2017	27	16	69	37	276	148	6	1	1	1	1	Bishop Vaughan Catholic School	Ysgol Tryfan
2018	30	14	72	27	288	108	6	-	2	1	3	St Cyres Comprehensive School	Ysgol Gyfun Glantaf
2019	33	17	98	32	392	128	4	-	2	1	3	Brynteg School	Ysgol Tryfan
2020	46	21	172	46	688	184	5	-	1	-	3	The Cathedral School, Llandaff	Ysgol Tryfan
2021	25	16	143	55	572	220	2	-	1	-	3	The Cathedral School, Llandaff	Ysgol Tryfan
2022	25	14	111	50	444	200	3	-	2	1	3	St Martin's School	Ysgol Gyfun Glantaf
TOTAL	247	130	761	289	3044	1156	16				4		

Over the 10-year period:

Total number of individual schools involved = 106.

Total number of school students involved = 4,200.

Total number of individual PhD students involved = 48.

Total number of individual early career researchers (ECR) involved = 16.

Total number of individual academic staff involved = 14.

Total number of individual administrative staff involved = 3.

Geographic reach of the LSC/HGB 2013–22

Figure 5 illustrates the geographic reach of the quiz from 2013 to 2022, evidencing engagement from 106 secondary schools from 21 out of 22 local authority areas in Wales.

Collection of additional impact feedback

In April 2023, additional impact feedback was sought via email and a Google Forms link (aimed at previously participating pupils, teachers and university students). The pupil online form was sent via teacher contacts to pupils who had participated in the quiz since 2019. The student form was sent to all currently known email contacts of students who had supported the quiz. Each group's responses are analysed in the relevant subsections below.

Pupils

Pupil feedback is sought from the quiz quarter-finals onwards. Table 2 summarises pupil responses to selected questions collated via completion of paper forms and Mentimeter (from 2020).

Of the 31 per cent of pupils to say that the LSC/HGB had not increased their enthusiasm, the majority indicated that they were already interested and still enthusiastic following participation. When asked whether the questions were too easy, too challenging or appropriate, 75 per cent of total responses ($n = 325$) stated that the questions were appropriate, 22 per cent indicated 'too challenging', and 3 per cent indicated 'too easy'. The top three favourite rounds voted by student ($n = 329$) are the General Science, Elementary, and Who Am I? rounds; 30 per cent of student responses ($n = 318$) voted Data Analysis their least favourite round. However, the team continues to include this round, given the important insight into key required scientist skills which it provides.

Since 2020, pupils have been asked to sum up the quiz using just three words, and of the responses ($n = 121$), the most popular words are 'fun', 'challenging' and 'interesting', followed by 'exciting', 'educational' and 'competitive', reflecting a positive experience. A limited number of individuals used single occurring words such as 'tense', 'scary' and 'tough', evidencing the more demanding aspects of the quiz.

When describing the benefits/impact of taking part in the quiz, pupils particularly liked the scope of the quiz to develop generic skills such as teamwork and discussions, as well as motivating them to prepare for formal examinations and the opportunity to represent their school in a team format. Of the total responding pupils ($n = 13$), 46 per cent ($n = 6$) said that taking part in the quiz influenced their A-level choices, and 23 per cent ($n = 3$) said that participating influenced their degree choice. (A summary of pupil impact statements can be accessed here: https://www.cardiff.ac.uk/__data/assets/pdf_file/0003/2773821/Quiz-Pupil-Impact-Evidence.pdf).

Table 2. LSC/HGB pupil feedback results 2014–22

Question	Yes (%)	No (%)	Unsure (%)
Have you enjoyed taking part in the Life Sciences Challenge? ($n = 330$)	97	3	
Has participating in the Life Sciences Challenge altered your approach/enthusiasm for studying sciences and maths? (Asked from 2018 onwards, $n = 296$)	69	31	
Has taking part enhanced your learning of science? (Asked from 2020 onwards, $n = 122$)	70	16	14

Table 3. LSC/HGB teacher feedback results 2014–19 (n = 58)

Question	Yes (%)	No (%)
Has your school enjoyed participating in the Life Sciences Challenge?	97	3
Has the Life Sciences Challenge been a useful curriculum support?	81	19
Were the questions in the Life Sciences Challenge set appropriately for Year 10–11 students?	83	17

Teachers

Over the 10-year period, 120 teachers have engaged in the quiz. Teacher feedback was obtained between 2013 and 2019, prior to the online delivery of the quiz. Table 3 evidences teacher responses to selected questions collated between 2014 and 2019 via completion of a paper form.

In 2022, teachers ($n = 9$) commenting on the main reasons for taking part highlighted that the quiz inspired and extended their students, and often provided a first insight into university life. When describing the impact of the quiz, teachers stated that it is an excellent vehicle to recognise the mathematic and scientific abilities of students, giving them the opportunity to represent their school. Several teachers have adapted quiz materials into their regular science teaching. (A summary of teacher impact statements can be accessed here: https://www.cardiff.ac.uk/__data/assets/pdf_file/0005/2773823/Quiz-Teacher-Impact-Evidence.pdf).

University students

Between 2013 and 2022, 52 students have been involved in the design and delivery of the quiz. Reasons that students ($n = 15$) provided for getting involved included aspiring to inspire the next generation of scientists, fulfilling a desire for public engagement involvement, and conveying the sense of the reward to be had from participating in scientific research. Students also commented positively about the development of their collaborative and communication skills, and about the satisfaction of being part of a unified team effort. The majority of students indicated no challenges experienced in supporting the quiz, describing their involvement as being manageable alongside their PhD. Several students highlighted the appropriate pitching of quiz questions, and also that encouraging participants to learn beyond the taught syllabus was challenging.

(A summary of student impact statements can be accessed here: https://www.cardiff.ac.uk/__data/assets/pdf_file/0004/2773822/Quiz-Student-Impact-Evidence.pdf).

Lessons learnt

Over the first 10 years of running the quiz, we have learnt important lessons that help us to sustain the LSC/HGB in an ever-changing and challenging environment for all stakeholders involved. These are summarised below.

Running an annual engagement activity such as this requires input from a multidisciplinary team of researchers, PhD students and engagement professionals, as well as sustained funding. In Cardiff University School of Medicine, a small core-funded PPIE team coordinates public engagement activity across the institution, supported by a core-engagement budget. When author AW moved on, the organisation of the LSC/HGB was subsumed by the PPIE team, ensuring its future development and sustainability. Often initiatives such as these have a short lifespan purely because their creators are on short-term contracts linked to specific research grants (Langenberg, 2001; Woolston, 2021).

The presence of an SiH academic lead with protected time for public engagement, has proved invaluable to ensure:

- that the LSC/HGB complements and aligns with the 'science and technology' area of learning in the Curriculum for Wales (Hwb, 2020), and challenges students to broaden their science learning and undertake tasks that will prepare them for a career in science
- the annual recruitment of PhD students to support the design and delivery of the LSC/HGB
- that appropriate direction and support is provided to the PhD students.

At the outset of an individual's potential research career, it is important to offer opportunities to engage audiences in the research being undertaken (Jensen et al., 2008; Pham, 2016; The Vitae Researcher Development Framework, 2024). The quiz has evolved to act as a public engagement activity driven by PhD students, providing a mutually beneficial platform to develop key engagement and communication skills in a supportive environment, and to ensure the continued freshness and innovative delivery of the quiz. Some members of academic staff involved in the delivery of the LSC/HGB reported that this needed to be done in their own time. Often, time given to public engagement of this nature (acting as a bridge between the university and schools, aiming to inspire the next generation of science talent) is seen to be voluntary and not part of the academic role, which is a recognised problem of the culture within the higher education sector (Eberl et al., 2023; Meredith, 2021; Weingart et al., 2021).

From the outset, this initiative was offered bilingually in English and in Welsh. Welsh-medium/bilingual secondary schools have valued this opportunity, evidenced via the successful engagement of over 70 per cent of these schools. Several participating Welsh-language teachers have confirmed that they 'highly valued the competition in school', and have been grateful that pupils have had the opportunity 'to compete through the language in which they are taught'. They confirmed that: 'There are very few opportunities like this, run in an efficient way (and for free) that make it easier for teachers to organise to take part.' Bilingual offerings are 'very uncommon', and 'the HGB has been one of the only bilingual opportunities presented to us over the last decade':

The quiz rounds are very well translated ... which makes the quiz much more accessible to pupils. Sometimes translated resources can be clunky or machine translated which make their use difficult, but this is not the case for the HGB. The fact that pupils can have a fun quiz round like Scientific Answer Smash in 'proper' Welsh is a big thing they do not get in some walks of life. It is bilingualism at its best, where both languages have the same provision.

The following have proved instrumental in maintaining the bilingual intention of the LSC/HGB to the required excellent standard:

- the constant presence of bilingual resource within the core PPIE team
- attracting involvement from Welsh-speaking PhDs (one PhD student even learnt Welsh, and went on to deliver the HGB!)
- having a budget to outsource Welsh translation to a trusted expert scientific translator.

Teacher buy-in is key to the growth of the LSC/HGB, as engagement in the LSC/HGB requires a time commitment on behalf of teachers, including identifying teams of school students and appropriate times within the timetable to engage in the quiz, supporting invigilation during the quiz rounds, and acting as the point of contact between Cardiff University and participating teams. Time commitment and working within the school timetable have been highlighted as a challenge for some teachers. However, adopting a hybrid model since 2022 has provided additional flexibility, reduced time pressures for all involved, and avoided the need for staff, university students, school students and teachers to travel long distances (particularly for the more isolated schools) to take part in the quarter- and semi-finals.

Maintenance of the science teacher contact database supports the year-on-year participation of several schools. Database maintenance, however, is a constant challenge, and is time-consuming. Linking with teacher networks such as the [Welsh Education Consortia \(n.d.\)](#), the [Royal Society of Biology \(2024\)](#) Scottish Teacher Network, and organisations such as [SSERC \(2024\)](#) can help facilitate contact with teachers.

Mechanisms to capture lasting stakeholder impact data need to be thought through at the outset. A recognised limitation of this stakeholder impact data section of this article is that the sample sizes are small. Many of the pupil impact questions posed require at least a 12-month gap from the end of the engagement, and rely on teacher support to forward the link on to pupils.

The LSC/HGB is a team event that motivates and challenges science pupils to learn beyond the parameters of the curriculum. It provides young people with a passion for STEM with a level of recognition comparable to competitions available in the humanities and sports. This is best exemplified by the fact that one secondary school that won the quiz displays their trophy alongside its sporting accolades, highlighting the value it has ([Figure 6](#)).

Figure 6. Whitchurch High School trophy cabinet, showcasing LSC/HGB trophies alongside sporting trophies/accolades (Photograph: Anne Davies)



The future of the LSC/HGB and concluding remarks

The team vision is to engage all secondary schools in the online preliminary round of the quiz. This will be encouraged by accommodating audiences for the final in person and via live streaming, to include Year 10 pupils from non-participating schools to watch the quiz in action, and to be inspired. Taster workshops are also planned to be delivered by our PhD students in the autumn term to Year 10 pupils attending schools in deprived areas of Cardiff to encourage sign up to the quiz preliminary round in the following February.

The LSC/HGB model can be adopted in other areas/countries. Potentially, there is the opportunity to run quiz finals across regions of the UK. The team would be happy to work with other universities interested in delivering an LSC to provide further detail and access to a bank of questions to get teams started.

The LSC/HGB will continue to evolve to ensure its aims, novelty and distinctiveness are maintained for future Year 10 pupils across Wales.

Acknowledgements

Thanks to all past and present PhD students and members of staff for contributing to the delivery of this initiative since its conception, to all participating school students and teacher facilitators, and to the Association of the British Pharmaceutical Industry for their continued support of the quiz prizes since 2014. Thanks to Mike Roberts for supporting the online delivery of the quiz, and for researching and discovering Flexiquiz, and to Christie Conlon (Cardiff University Graphic Designer at the time) for design of branding for all components of the SiH programme. Thanks to Professor Matthias Eberl for his advice and continued support and encouragement.

Funding

This initiative has received funding from a Cardiff University Engagement Fund and a Wellcome Trust ISSF2 Public Engagement Fund. Annual running costs associated with the quiz continue to be drawn from the Cardiff University School of Medicine Patient and Public Involvement and Engagement budget. LSC/HGB prizes have been sponsored by the Association of the British Pharmaceutical Industry (ABPI, www.abpi.org.uk) since 2017.

Declarations and conflicts of interest

Research ethics statement

Not applicable to this article.

Consent for publication statement

Not applicable to this article.

Conflicts of interest statement

The authors declare no conflicts of interest with this work. All efforts to sufficiently anonymise the authors during peer review of this article have been made. The authors declare no further conflicts with this article.

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