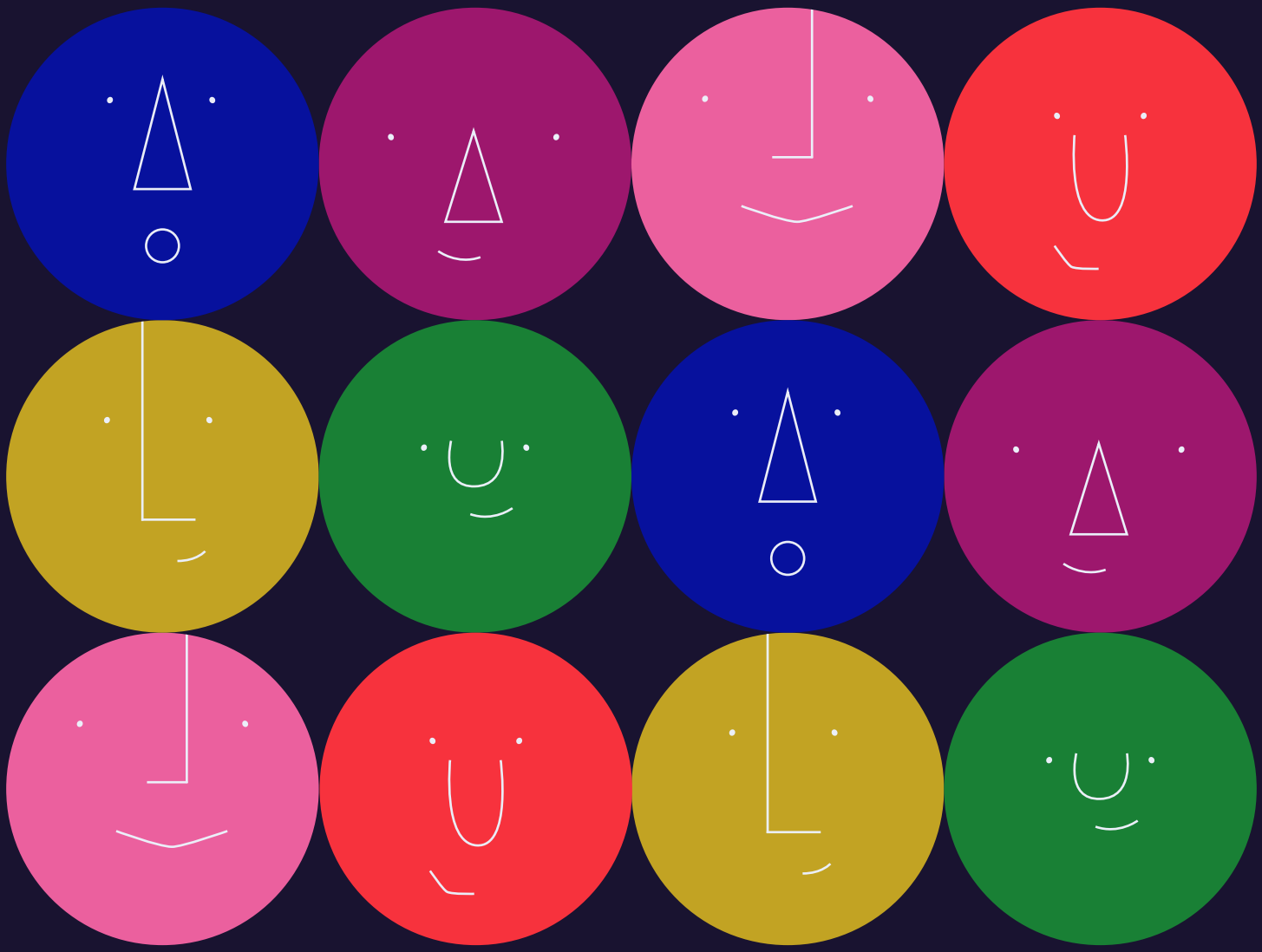
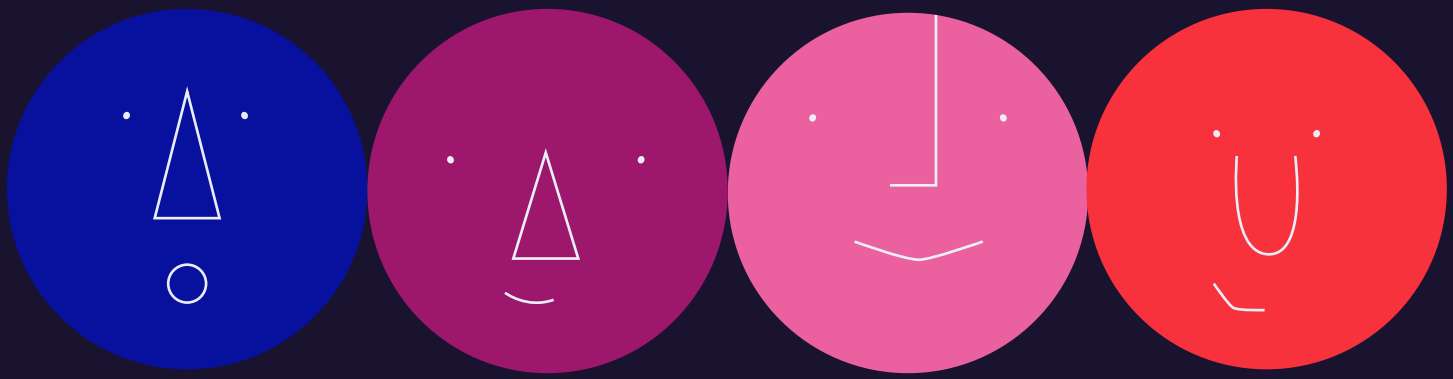


# Digital Schoolhouse:

## An inclusive approach to teaching computing?

Dr Irene Bell | Andrew Csizmadia | Dr Yota Dimitriadi



DIGITAL SCHOOLHOUSE together with NINTENDO SWITCH ukie

2021

# About the authors

## DR IRENE BELL EdD; MA(Ed); BSc (Hons)

**PGCE Principal Lecturer, Initial Teacher Education and Head of STEM, Stranmillis University College**

Dr Irene Bell is a Principal Lecturer in Initial Teacher Education and Head of STEM at Stranmillis University College. She is the Chair for Northern Ireland of Computing at Schools, the Northern Ireland representative on British Computer Society Academy Computing Board and the Teacher Education representative on Cyber Skills Group (NI). Dr Bell's work within Europe includes being a UK representative on the Computing in Schools special interest network within the Council of European Professional Informatics Societies. She was invited by European Commission Directorate General for Education, Youth, Sport and Culture to be part of their expert panel in working on their 'EU Computer Science for All' initiative. (Sept 2019). She was honoured to be an invited member of the International Association of STEM Leaders (Women in STEM). Dr Bell has been the recipient of Teaching Awards in 2005, 2007 and of the 'Blackboard Technology Award' (2013).

## ANDREW CSIZMADIA

**Programme Leader for Computing Science, Newman University**

Andrew taught computer science in secondary schools and post 16 education establishments in North Wales for over 15 years. Then he was appointed to lead the Super Cisco Academic Training Centre for EMEA based at Birmingham City University training Cisco Academy instructors. Currently, Andrew is employed as a Senior Lecturer Secondary Computing at Newman University where he is the subject lead for the BSc Computer Science programme. Andrew was seconded to the British Computer Society as the Academic Lead for the BCS Certificate in Computer Science Teaching. Andrew has been and continues to be involved in both regional and national initiatives for supporting in-service teachers in the transition from teaching ICT to Computing, and especially programming. He is a member of the Computing At School Computational Assessment Working Group, and a co-author of the report: Computational Thinking: A guide for Teachers. Andrew is a member of the board of Codeweek.uk and TPEA.

## DR YOTA DIMITRIADI

**Associate Prof in TEL & Computer Science Education, University of Reading, Institute of Education**

Dr Yota Dimitriadi is an Associate Professor of TEL & Computing Education at the Institute of Education, University of Reading. She is an experienced teacher-educator and has been awarded the competitive and prestigious National Teaching Fellowship Award by Advance HE in recognition of her work in inclusion and diversity. Her PhD was on technology and bilingual children with dyslexia and she also worked for a local authority as a dyslexia assessor for students with English as a Foreign Language. She has been successful for numerous funding applications around computing education and teachers' professional development, including securing the highly competitive international Google PD Grant for two consecutive years. She has also organised and hosted a series of successful interdisciplinary conferences, including a very successful BCS Lovelace Colloquium in 2014.

# Contents

# FOREWORD

There is famous cartoon, drawn by Peter Steiner in 1993, showing a dog at a keyboard, saying to another dog “On the internet, nobody knows you’re a dog”. This cartoon, drawn by Peter Steiner in 1993, started as a joke, but it has come to mean more than that.  As Wikipedia puts it: the cartoon symbolizes the liberation of one’s Internet presence from popular prejudices. Sociologist Sherry Turkle elaborates:

“You can be whoever you want to be. You can completely redefine yourself if you want. You don’t have to worry about the slots other people put you in as much. They don’t look at your body and make assumptions. They don’t hear your accent and make assumptions. All they see are your words.”

And yet actually, we find that computing is full of inequality and bias (whether unconscious or not).  So it is very welcome that the Digital Schoolhouse Project takes the issues of diversity and inclusion seriously, and has produced this independent report looking at the extent to which DSH upholds the aspirations of equity that we all share.

Computing really is for everyone: female, male, or transgender; black, white, or brown; tall or short; extrovert or introvert; disabled or not.  For some it may offer a rewarding pathway into a well-paid, creative, respected job.  But whoever you are, a foundational knowledge of computing can equip you to have agency in the world, so that you are an active and empowered participant in it, rather than a powerless subject.

That, surely, is a future to which we can all aspire.

**Simon Peyton-Jones**
**Senior Principal Researcher**
**Microsoft Research, Cambridge**

# WELCOME

Catering to diverse audiences, being inclusive and ensuring equal access for all learners to high quality education is and should be an intrinsic part of everything we do. Digital Schoolhouse has been built upon this philosophy. It is so incredibly important to us that all learners; regardless of how old they are, who they are or where they come from; are able to participate in our activities and have an incredibly fun time whilst doing so. Computing is a fun subject, one that we can all engage in and indeed need to if we are going to play our part in shaping what tomorrow's world looks like.
That is why we wholeheartedly welcome this examination into the Digital Schoolhouse programme; and ask the question, "Are we as inclusive as we would like to be?".

We are thrilled with the outcomes; and take on board the recommendations set with a view to continuously strive for improvement. We hope that others can also learn from our experiences. Therefore, the report concludes with a number of factors for consideration; questions we can each ask ourselves when developing inclusive opportunities for students.

I would like to thank the authors; Andrew Csizmadia, Dr Irene Bell and Dr Yota Dimitriadi for undertaking this project and helping us to learn more about how we can deliver computing in a creative and inclusve way that is accessible to everyone. I'd also like to thank all the teachers involved with the programme; your daily ingenuity helps us to continue to innovate.

Remember; no idea is too crazy!

**Shahneila Saeed**
**Director, Digital Schoolhouse,**
**Head of Education, Ukie**

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ukie

# Executive summary

Now more than ever it is important to reflect on Equality, Diversity and Inclusion and the importance of all young people being offered opportunities to participate in engaging computing activities that inspire them to consider computing as a possible and feasible future career option. Digital Schoolhouse (DSH) offers a wide portfolio of creative resources embedded in collaborative approaches and working with teachers to inspire young people.

This report aimed to explore how those Equality, Diversity and Inclusion principles are viewed by the key recipients of the programme. Key recommendations explore not only how to improve the programme but also the role of the programme among wider educational initiatives and scope for further evaluation on the programme impact on wellbeing.

## Summary of recommendations

| | |
|---|---|
| 1. Deliver teacher training on inclusivity | Digital Schoolhouse ensures that the lead teachers are inclusive in their selection of schools to engage with and when presenting the programme to the primary schools. |
| 2. Signpost Diversity & Inclusion on website | Website developments to include further signposting of Diversity and Inclusion. |
| 3. Continue to develop One Minute Mentor | Ensure that imagery on the resources promote the equality agenda further. |
| 4. Further promote equality via imagery | Develop the One Minute Mentor resource, a model of good practice, to promote building computing cultural capital. |
| 5. Wider industry links | Investigate how Digital Schoolhouse can support students' well being. |
| 6. Contribute to the work and recommendations around promoting creativity in education | Investigate how Digital Schoolhouse supports and promotes creativity amongst lead teachers and the programme's outreach. |

# Preamble

Since the programme's inception in 2014, Ukie's Digital Schoolhouse (DSH) together with Nintendo UK and sponsored by PlayStation®, SEGA, Ubisoft and Outright Games, has continued to expand by capacity, outreach and activity delivered. Currently, the programme has onboarded 50 institutions including academies, maintained schools, independent schools, colleges and community interest companies. Collectively, DSH is estimated to reach 30,000 pupils and 3500 primary teachers in the next academic year.

## 2014 THEN

In response to an outdated ICT education and with recommendations from the NextGen Skills Report, the new Computing curriculum was launched in 2014. This was a breakthrough. By aiming to equip pupils with relevant digital skills, it would enable the next generation to succeed in a digital economy, whilst encouraging homegrown talent.

With such revolutionary news, reactions within the education sector were mixed. Digital Schoolhouse was ready to provide a solution.

With seed funding from the Mayor of London's Schools Excellence Fund (LSEF) and expertise from Mark Dorling and Shahneila Saaed, the DSH programme was to be rolled out across the UK.

## NOW 2021

Digital Schoolhouse continues to help teachers to explore and innovate ways to approach the Computing curriculum, in addition to developing resources and delivering CPD and training to teachers.

The programme also engages thousands of students with its pioneering immersive careers education. Schoolhouses are not charged for their participation in the programme, nor for the support that they receive.

Since 2014 and just 9 Schoolhouses, the DSH network is now 50 Schoolhouses strong and predicted to reach 30,000 pupils and 3500+ teachers over the next academic year.


In accordance with educational good practice, the DSH programme undertakes periodic review of its programme through various lenses of focus, examining and reviewing the programme structure, its implementation, resources and all deliverables. This is to safeguard the high standards set by the organisation and to uphold the core values set by DSH whether it is in the programme implementation, resources or training.

The focus for this report is Diversity and Inclusion, in accordance with Core Value 3 of DSH: Diversity: To enable all students to thrive in a 21st century creative digital economy. The report explores how that core value of the DSH programme is interpreted by the teachers participating in the programme. Their perceptions, insight and first-hand experience of the programme delivery and impact in the classroom will provide feedback on how equality and inclusion is embedded in the current programme and inform future priorities.

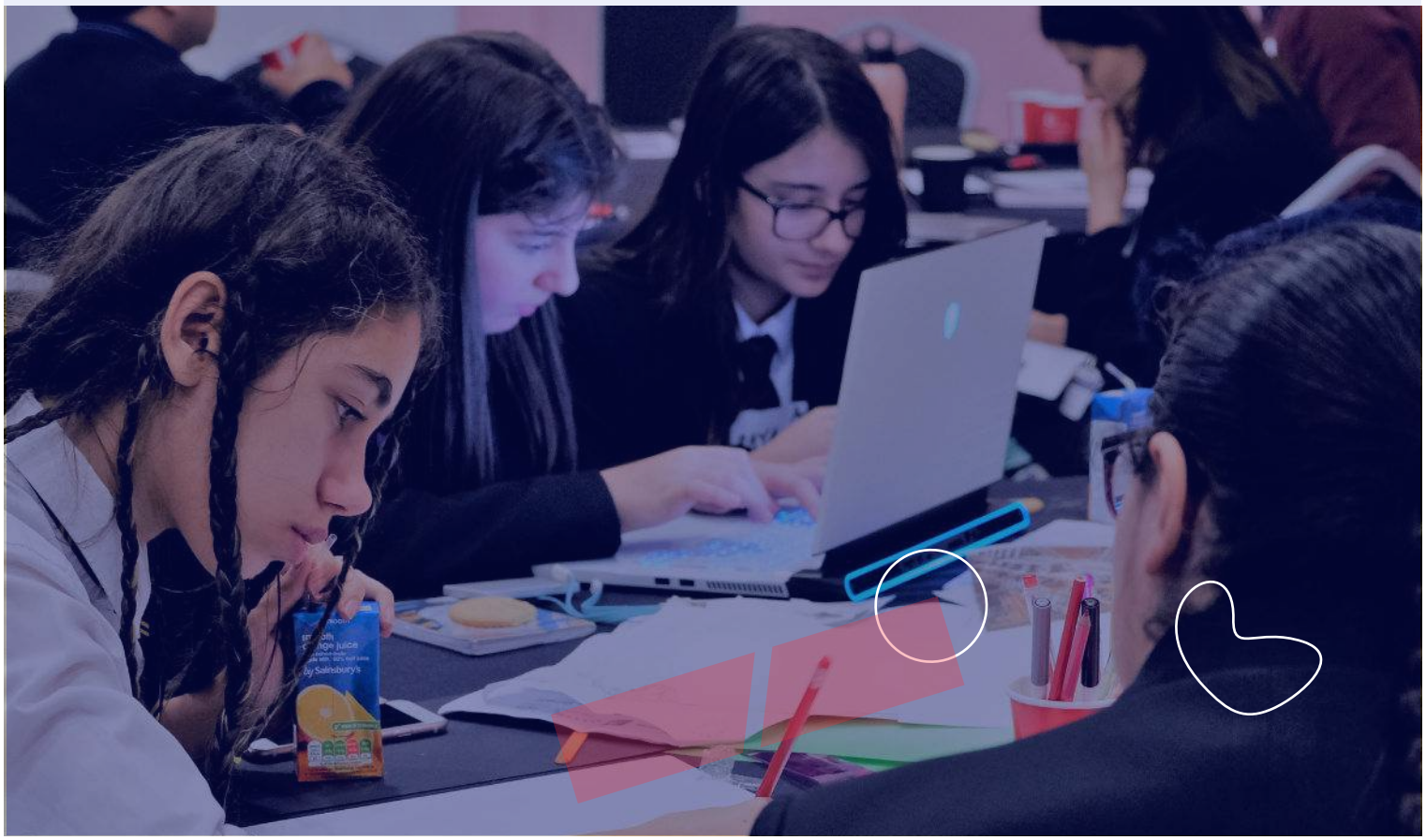
# Context

The introduction of computer science into the compulsory school curriculum at both primary and secondary level has become a worldwide phenomenon. Different countries are at different stages of adopting and embedding computer science within their compulsory school curriculum. In England, computing as a national curriculum subject for state funded schools, covering Key Stage 1 through to Key Stage 4, was introduced in 2014 following the disapplication of Information Communications Technology (ICT) from the English national curriculum (Brown et al, 2014). However, it is at the discretion of each academy, each free school, and each independent school to decide whether they offer computing as part of their school's curriculum.

Within England, computing is regarded as having three independent but interwoven strands, those of Computer Science, Information Technology and Digital Literacy. In 2012, GCSE Computer Science was introduced by OCR, one of the awarding organisations in England and subsequently offered by the other awarding organisations AQA, Cambridge International, Pearson Edexcel and WJEC.

At the heart of the revival and restoration of a compulsory computing education is the vision for inclusivity of computing education and accessibility to all. However, the Roehampton Annual Computing Education Reports (2018; 2016) provided detailed demographic analysis of the uptake of computing qualifications within England and illustrated the diversity gaps in the uptake of computer science for GCSE and A Levels in the country. Their findings reaffirmed the well documented underrepresentation of female and BAME learners in computing courses that lead to a formally recognised qualification (Ibe et al., 2018).

The data also highlighted spikes in the representation of SEND and pupil premium students and the need for further research to understand reasons behind lower attainment for pupil premium or further disaggregation of data around SEND, which again is documented in the research literature (Hutchinson, Reader and Akhal, 2020: IAEG-SDG 2019).



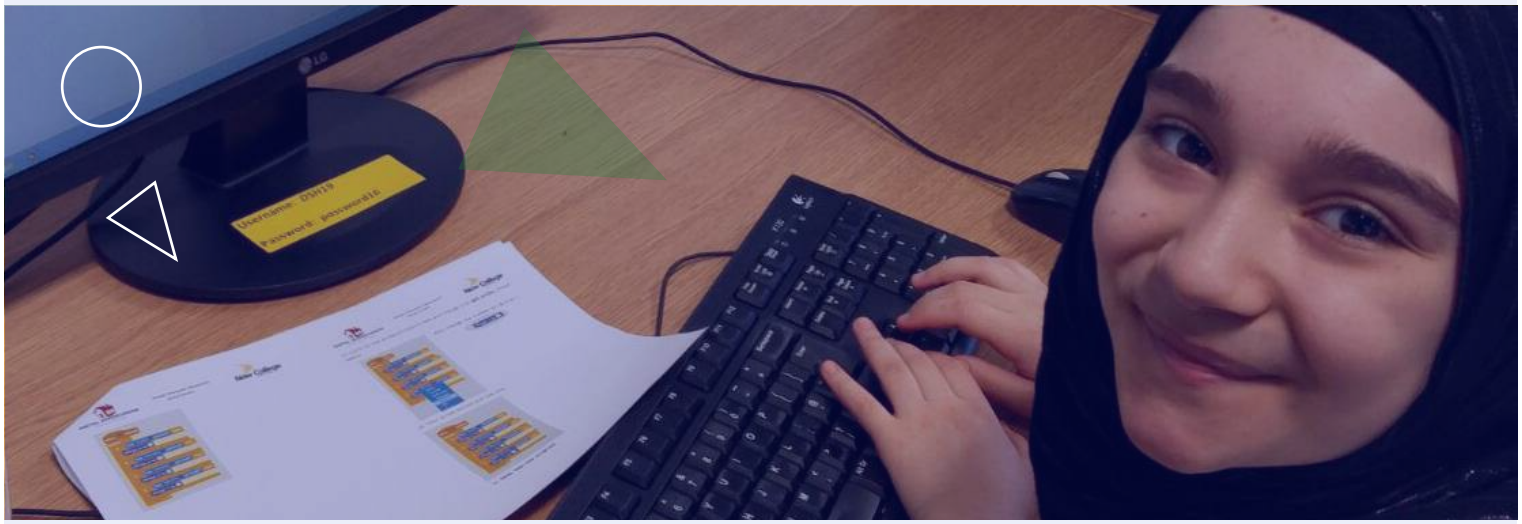
While the report did not identify social or structural factors that hinder participation and lead to unequal access in Computer Science, it provided an evidence-based platform for further considerations around equity, diversity and inclusion for schools and implications that it can have for the future of the subject and the workforce of the future.

Royal Society's (2017) review of the impact that the introduction of computing in the school curriculum had, also reinforced the need for further support around widening access and maximising participation to computing for all learners, especially those from underrepresented groups. This support was deemed particularly necessary to address representation gaps within GCSE and A Level Computer Science cohorts and ultimately both university computing cohorts and the IT workforce. Among the 12 recommendations of the accompanying report 'After the reboot: computing education in UK schools' (Royals Society, 2017) there was the recognition of enhancing teachers' confidence and skills in computing, which led to the establishment of a National Centre for Computing Education (NCCE) in England, tasked to deliver targets around inclusion and teacher professional development. The gender imbalance within computing education and the IT workforce has been widely reported (Kemp, Wong & Berry 2018; Margolis et al., 2017; Royal Society, 2017; Wanger, 2016). The major research programme Gender Balance in Computing (2019-2022) (NCCE 2021), aiming to increase the number of female students taking Computer Science is also one of the key outcomes of the Royal Society Report.

# Pedagogical approaches that promote inclusive Computing for all

Research has reported on the many interlinked intrinsic and extrinsic reasons that contribute to uneven representation in Computer Science. Dominated gender (Kemp, Wong and Berry, 2019) and race (Google, 2016) paradigms and discourses potentially reinforced by parents, teachers and the media can affect self-efficacy and confidence in Computer Science ability and have impact on student access and participation in the subject. While these reasons may be documented more widely for some underrepresented groups, they pose inclusive and intersectional pedagogical considerations for all students.

Inclusive approaches to address uneven representations in Computer Science emphasise the importance of collaborative, inquiry-based interventions as well as the importance of acknowledging learners' lived experiences and capitalise on learning that takes place in both formal and non-formal settings (Eglash et al. 2006).



Worldwide initiatives such as Astro Pi, Code Club, The Hour of Code, Girls who Code, Microsoft Make Code and UK initiatives such as Bebras Computational Thinking Challenge, BBC Make IT Digital aim to inspire learners in schools to engage with computing education. Such approaches follow gamification of the curriculum, creative computing, physical computing, and the adoption of unplugged pedagogy as inclusive and accessible approaches for teaching computer science concepts and principles. Programmes like Barefoot Computing and Digital Schoolhouse also focus on promoting curiosity and excitement around computing through creative and inclusive cross-curricular teaching and learning ideas.

These programmes also recognise the importance of building resilience and creative thinking and offer learners opportunities to problem solve and experiment. They are also framed around a strong focus on building teacher capacity and offer professional development opportunities for teachers through training workshops, detailed lesson plans and video tutorials.

Technological developments, such as blocked-based programming languages, though not always fully accessible for users with assistive technologies, have introduced more inclusive ways for learning to code. Computing education researchers continue to investigate how computing education can be made accessible to all learners including those learners with special educational needs and disabilities (Israel, Lash and Ray, 2017) . For example, researchers who are members of Microsoft Research's Project Torino are developing Code Jumper, a physical programming language for visually impaired learners (Morrison et al., 2020).

# About the study

The Digital Schoolhouse programme is informed by the Universal Design for Learning (UDL) Framework (CAST, 2009) in order to promote equitable access and reduce barriers to learning in computing. An inclusive approach is also evidenced in the selection process for new DSH schools that the programme follows by encouraging schools to showcase their work and premises beyond a written application, through video clips, interviews and visits. In this way a rigorous but inclusive approach is followed.


Figure 1: Diagram shows the multi-stage selection process that Digital Schoolhouse applicants undergo.

DSH recognises socioeconomic barriers and misconceptions about computing as an inaccessible subject linked to gender stereotypes and perceptions of computing as an elite subject and as such DSH has adopted a creative and active play-based learning approach in the delivery of activities to learners attending sessions. The combination of unplugged and on screen activities also attempts to promote accessible safe spaces for learning while acknowledging uneven technology access that schools may face.

Promoting creativity in teaching and learning approaches that support computational thinking, collaboration and autonomy in learning are key axes embedded throughout the DSH programme which aspires to inform and empower teachers to follow these approaches widely in the teaching of computing. Students are encouraged to play an active part in tasks that offer opportunities to convert skills into knowledge about ethical, social and moral aspects of digital technologies.

When delivering Digital Schoolhouse outreach sessions, Digital Schoolhouse teachers work with a whole primary class instead of self-selecting learners as is the case with other non-formal setups like Code Club. These teachers provide all learners in a Digital Schoolhouse session with academic exposure to creative play-based computing activities that are intended to instil a positive world view about computing education. In this way the programme also supports the upskilling of primary teachers in practical and context-specific ways that address specific training and curricular needs of their school.

# THE MODEL

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SCHOOLS JOIN

## ACADEMIC EXPERTISE

Digital Schoolhouse support and train teachers with current thinking in educational practice.

## INDUSTRY EXPERTISE

Digital Schoolhouse work with industry partners to provide insight into real, relevant industry practices e.g. video games

## FREE WORKSHOPS

Schoolhouses offer free weekly computing workshops to visiting schools within the community.

## PERSONALISED SUPPORT

Schoolhouses offer continued professional development (CPD) and training to visiting teachers within the community.

SCHOOLS TRAIN

EMPOWERED TEACHING

PLAY-BASED LEARNING

INGENIOUS COMPUTING

The data for this report was collected through an online survey and was followed up by semi-structured interviews which were conducted virtually. Participants included DSH lead teachers as well as primary teachers whose classes have been involved in DSH workshops. Due to the COVID-19 pandemic it was harder to organise interviews in the timescale for the project and as a result there were no interviews arranged with primary teachers.

It was pleasing to see respondents from each of the categories (Disability, Ethnicity and Race, Gender and Socio-economic Inequality) contributing to the survey. In line with the increased number of DSH certified institutions ("Schoolhouses") and their "Lead Teachers" appointed to deliver the programme, the survey received corresponding numbers of respondents within each year group. All lead teachers opted to respond anonymously to the survey and input was received from seven geographical areas.

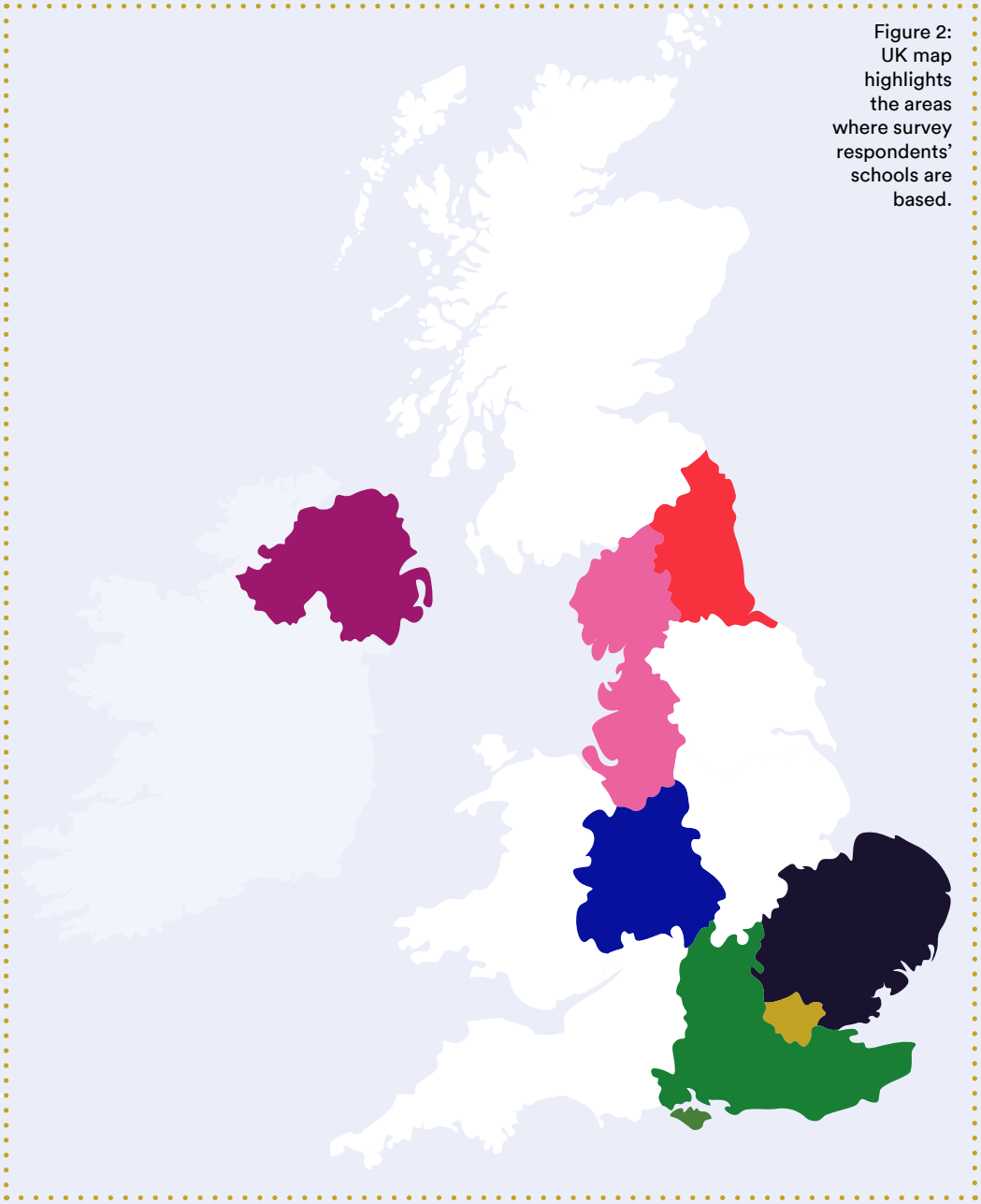


Figure 2: UK map highlights the areas where survey respondents' schools are based.

At the time of the report, there was a maximum of 47 DSH lead teachers across England and Northern Ireland who could have participated. Most of the areas of DSH are represented in the report with approximately 50% of Schoolhouses responding to the survey and/or interviews.

Interview numbers were significantly lower, however, despite the small numbers, there seemed to be saturation in the themes emerging from the interviews. Due to the pandemic and schools' emergent priorities, there was also a very small number of primary school teachers who participated in the survey. Initially the research had intended to incorporate interviews with primary teachers who had experienced the DSH programme delivery in their school.

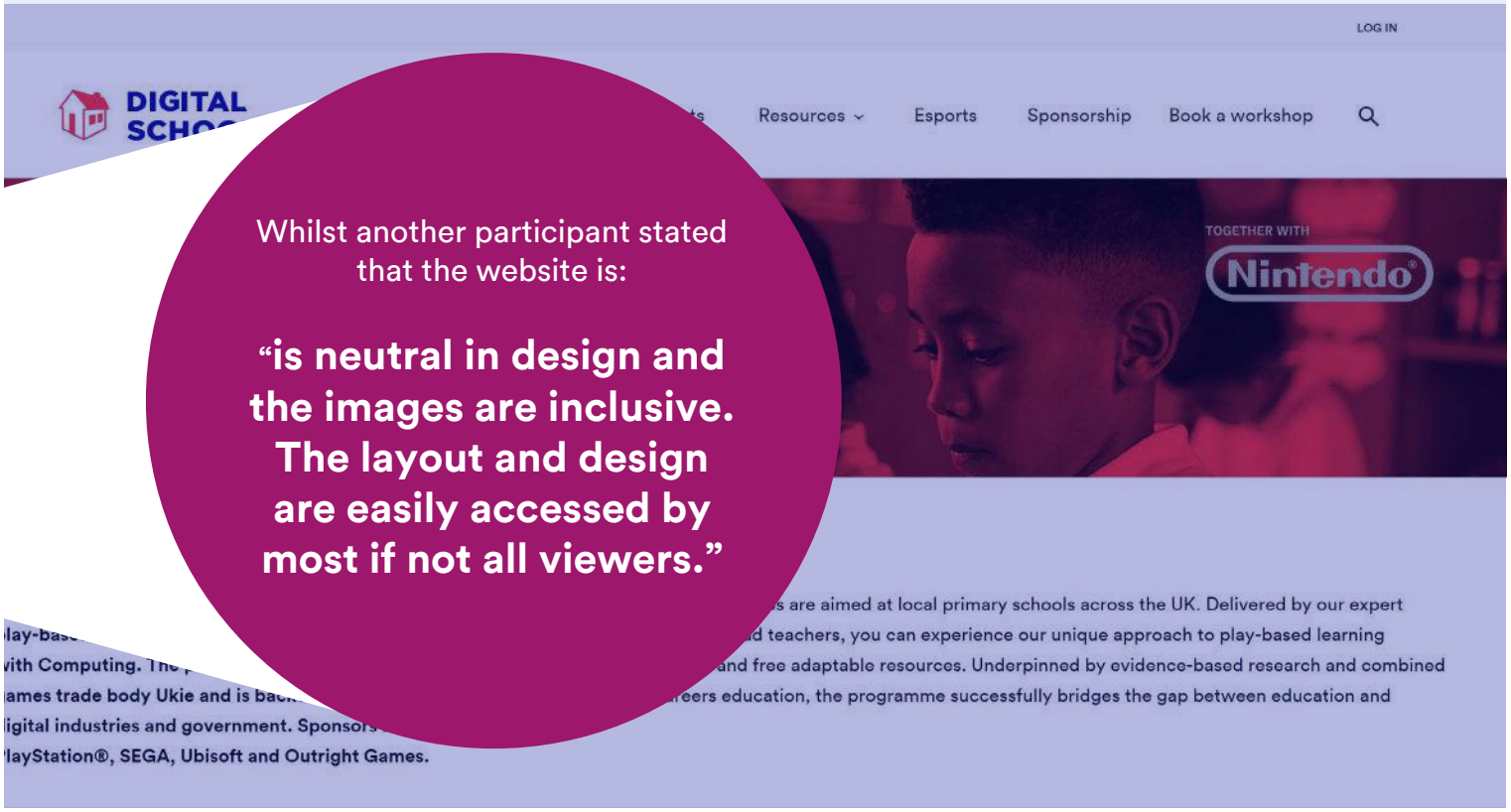
We were sensitive to the difficult conditions under which the primary teachers were working due to the COVID-19 pandemic and we decided that it would not be appropriate to organise interviews with them, additional to the survey request.

The three guiding principles of UDL around multiple means of representation, engagement, action and expression alongside recognition of the importance of Culturally Relevant Pedagogy (CRP) (Gay, 2002) have also provided the theoretical framework of putting together this report and analysing the data.

The data was analysed under each of the protected characteristics and includes participants' perceptions around DSH's teaching and learning resources including the website, as well as their experiences of delivering sessions. In each of the categories of Disability, Ethnicity and Race, Gender and Socio-economic Inequality, a majority of respondents indicated that the DSH resources appeal equally to all pupils. The two areas which raised most discussion were Disability and Gender both in terms of student experience as well as recommendation for further developments.

The overall tone of the survey feedback on the website is supported by the comment:

*"I feel it [DSH website] does overall, especially for gender and race, however, there is potentially more that could be done to specifically promote inclusivity of learners with disabilities. I do not feel there is anything actively disregarding those learners, however, some more explicit content/ imagery to show positive representation within the wider DSH community could be effective."*`



# Disability

KEY THEME

**“Using particular resources it was the SEND [Special Educational Needs and Disabilities] pupils that often got the most out of the workshop. As [the workshop was] less focused on the programming, more focused on the creativity of the exercise.”**

- Lead Teacher

Whilst 74% of respondents in the lead teacher survey indicated that the DSH resources appealed equally to all pupils, there was emphasis on the feedback around disability.

Lead teacher perspectives on the suitability of the resources seem to have been influenced by the respondents’ understanding of the term disability. Of those lead teachers who interpreted the term to mean a physical disability, there were comments on how they delivered some named lessons such as ‘Just Dance with the Algorithm’.

The majority of lead teachers commented that the ‘Just Dance Algorithm’ was suitable for all pupils as it could be easily adapted to facilitate physical disability by, for example, incorporating hand movements instead of dancing. The resource was described as being excellent, fun and engaging however it was mentioned that it did require pupils to physically move around and if not adapted by the lead teacher could exclude some pupils.

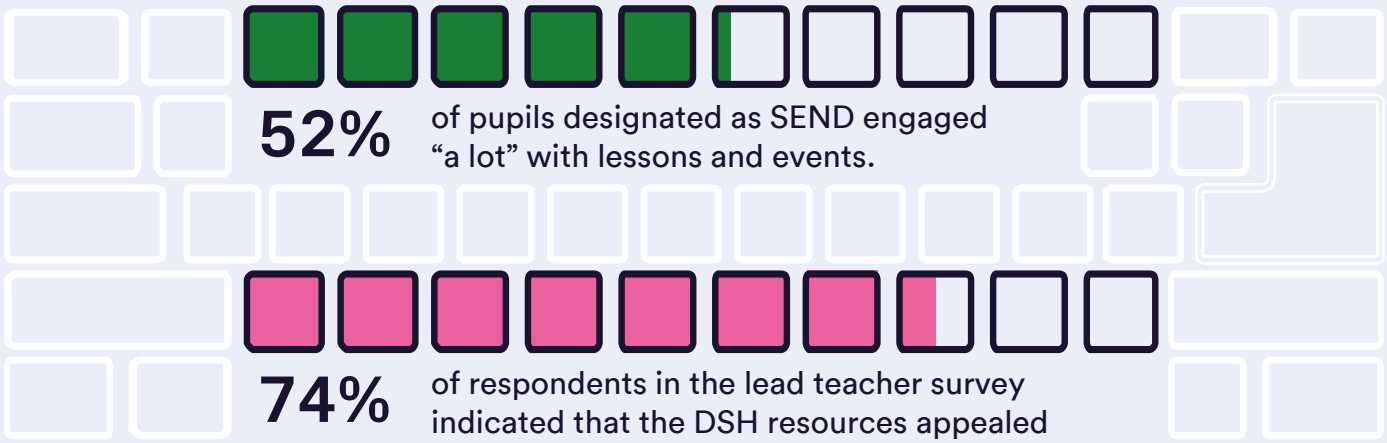
Some lead teachers who have delivered this piece also mentioned that this resource had been successfully delivered to groups of pupils on the SEND register while others modified small elements of the activity to ensure that it was suitable and accessible by all pupils.

**The survey revealed that the DSH lead teachers felt that 52% of pupils designated as SEND engaged 'a lot' with the lessons and events.**

**No DSH lead teacher felt that pupils designated as SEND did not engage at all.**

While the play-based approach to teaching computational thinking and computing was praised by several respondents where the phrase 'play-based' was interpreted only to mean physical play, there were some comments on physical disability and engagement. Several resources were highly praised for their accessibility by all pupils. These included 'Cryptography' where with support each child could produce a cypher wheel, 'Scratch Stories' which allow pupils to respond at their academic level and 'Cybersafe' which holds crucial learning for all pupils.

The survey revealed that the DSH lead teachers felt that 52% of pupils designated as SEND engaged 'a lot' with the lessons and events. No DSH Lead teacher felt that pupils designated as SEND did not engage at all. This was supported by the response from the primary school teachers who all reported that all SEND pupils were able to engage in the lesson. One lead teacher commented that *"Using particular resources it was the SEND pupils that often got the most out of the workshop. As less focused on the programming, more focused on the creativity of the exercise."*



**52%** of pupils designated as SEND engaged "a lot" with lessons and events.

**74%** of respondents in the lead teacher survey indicated that the DSH resources appealed equally to all pupils, there was emphasis on the feedback around disability.

While the physicality of the resources was highly praised, reference was also made to the teaching and learning materials being specifically adapted to support pupils with physical disability further. One lead teacher suggested replicating the resources in larger font and with reduced wording supported by pictorial triggers to aid those pupils with visual impairment. Making the resources more reader-friendly through reduced wording was also recommended by a few participants. It was suggested that some resources contained wording that was quite challenging for lower ability primary pupils. Participants mentioned signposting within each resource how differentiation could be integrated within these resources.

# Ethnicity & race

KEY THEME

**96% of the Lead teachers indicated that the resources and lessons were appropriate for delivery to pupils irrespective of their ethnicity and background.**

The respondents overwhelmingly agreed that the DSH resources were equally appealing and without bias when considering ethnicity and race. 96% of the lead teachers indicated that the resources and lessons were appropriate for delivery to pupils irrespective of their ethnicity and background. Adaptations to the popular 'Just Dance with the Algorithm' were shared, and included adaptations to dance examples inspired by other cultures and minority groups such as the Haka ceremonial dance.

Currently, DSH lead teachers are appointed annually on merit; having been recognised through a rigorous selection process which includes an interview with a non-bias third party. Lead teachers are selected because they are computing subject matter experts, whilst being committed to the vision of play-based learning which is central to the programme's pedagogical approach.

While personal data regarding ethnicity and race is not collected, it is worth noting that the DSH lead teacher network is a diverse and multicultural group.


The DSH esports tournament and associated events were praised for being open to a wide audience and the guest speakers were specifically mentioned as demonstrating making a concerted effort to promote inclusivity.

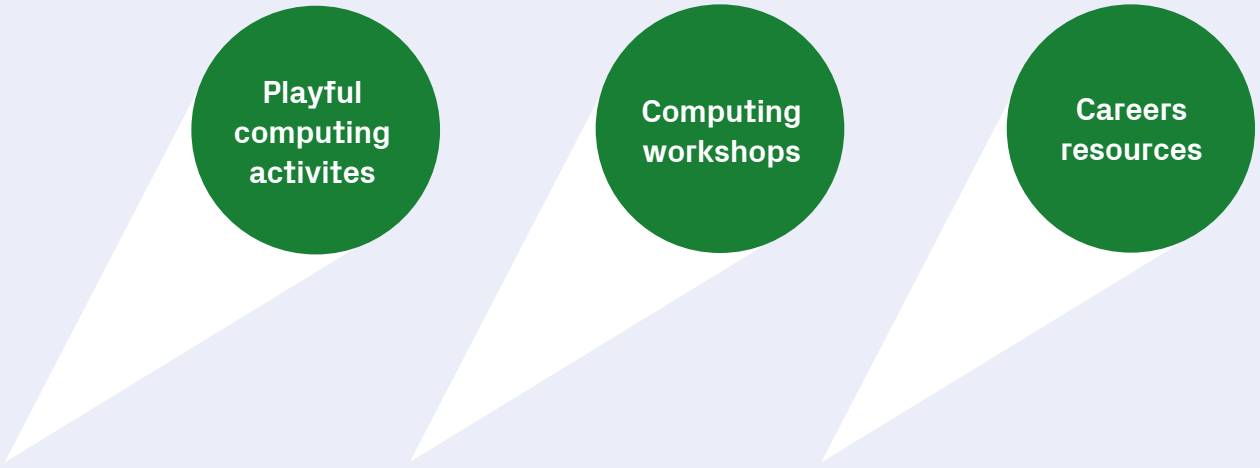
**96%** of the lead teachers indicated that the resources and lessons were appropriate for delivery to pupils irrespective of their ethnicity and background.

In response to Question 9 of the Lead Teacher's survey (Appendix) which asked the respondents to suggest ways in which DSH resources could promote further diversity, equality and inclusion More than half the respondents to this question suggested role modelling diversity and inclusion good practice by including a wide range of supporting images on the resources within the teaching packs.

It was suggested that pictorial characters should illustrate diversity to include age, gender, ethnicity, and disability. This is counterbalanced by respondents who indicated that *"when you browse the website you can see children from a number of different ethnic and racial backgrounds"*.

# Gender

KEY THEME

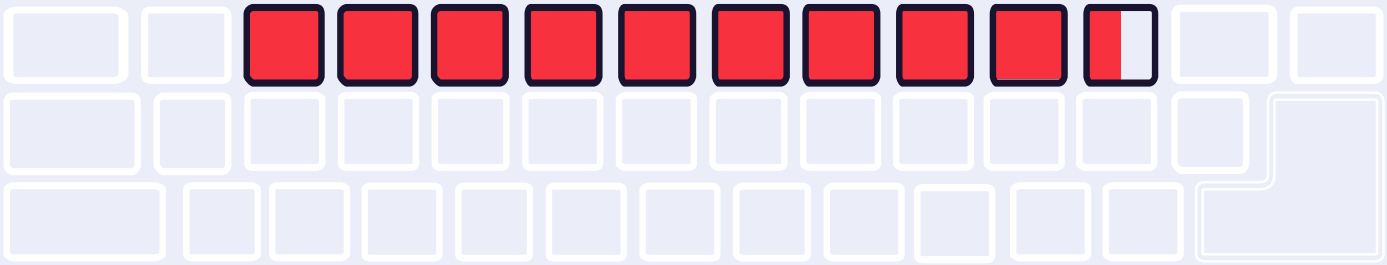



91% of lead teachers agree that the DSH resources appeal equally to both genders. Overall resources were described as having a 'gender neutral feel' with the exception of one teacher who reported that some of the games had more of a masculine feel but no further details were shared and there was no reference to specific tasks.

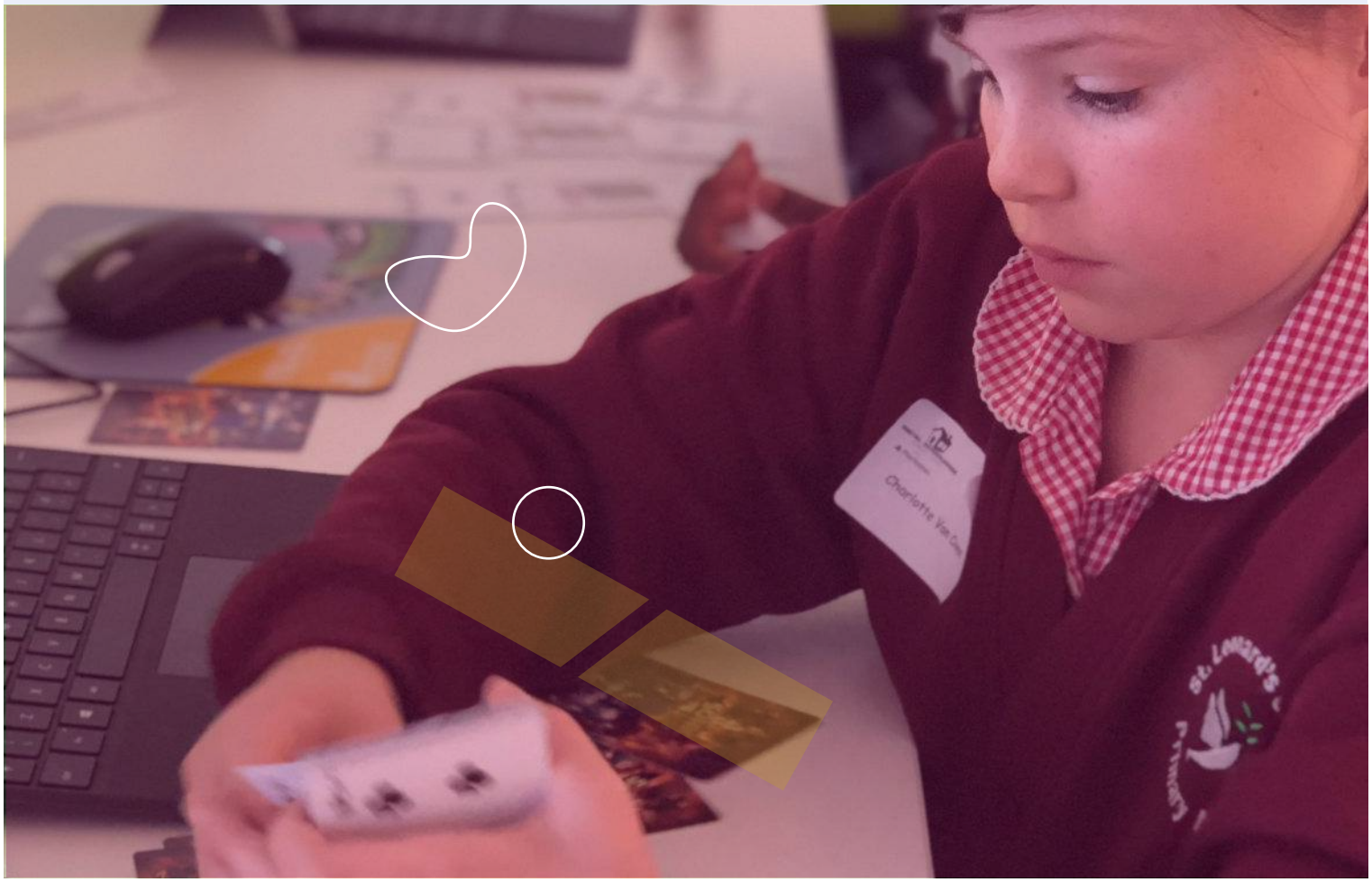
**The interactivity encouraged by the resources was mentioned as breaking down barriers and ensuring that all pupils had the opportunity to participate.**

The collaborative nature of the activities was also regarded as an inclusive approach for all and especially female pupils. Google (2014) in its report Women Who Choose Computer Science – What Really Matters summarises the following thematic approaches: Social Engagement, Self-Perception, Academic Exposure and Career Perception. Initiatives to address the gender imbalance in computing are summarised in Table 1 using these thematic approaches.

**91%** of lead teachers agree that the DSH resources appeal equally to both genders.



It was acknowledged that demographic and class information from the primary school varies and as a result, decisions about adapting lessons in advance may be harder for lead teachers. However, overall participants felt that resources had a wide and inclusive scope.

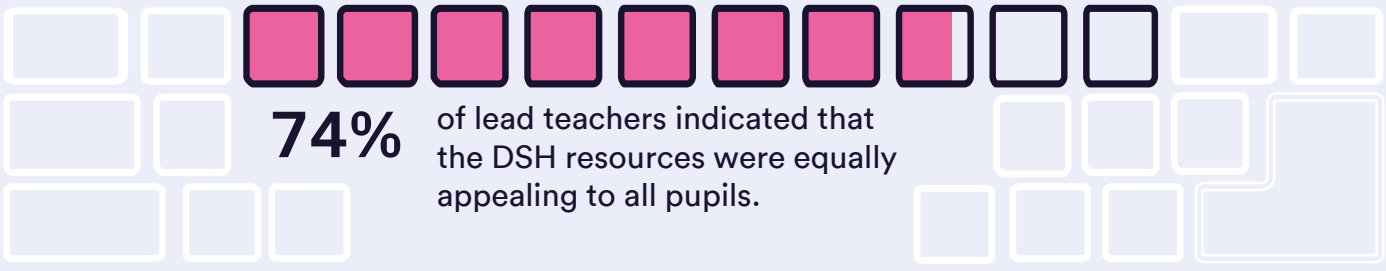


# Socio-economic inequality

KEY THEME

**Over 95% of the lead teachers indicated that those pupils on 'Free School Meals' were able to engage with the resources and lessons.**

This was another category where the majority of respondents, 78%, indicated that the DSH resources were equally appealing to all pupils. Praise was given to the recently created Learning Remotely resources (2020). Specifically, the work within 'How to Raise a Tech Genius' was applauded for its aspirational approach in promoting education accessibility at all academic levels and its focus on developing computational thinking through using unplugged resources which can be delivered without the absolute need for technology.



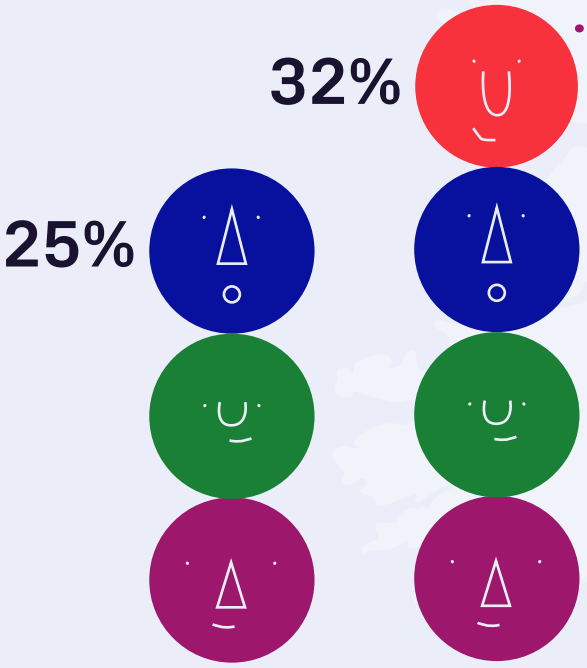
**74%** of lead teachers indicated that the DSH resources were equally appealing to all pupils.

'One Minute Mentor' was also named as a fantastic resource for career guidance, promoting and encouraging engagement and inclusivity for all children. *"It helps to show the variety of routes and backgrounds taken to access the industry and as it grows its roster, will no doubt continue to represent more and more characteristic"*. Comments within this area included the statement that unplugged activities *"help to engage with a wide variety of students and promote a more inclusive work ethic in general"*. Read more about One Minute Mentor.

Those respondents who had some reservations about the DSH programme being inclusive for pupils from all socio-economic backgrounds were primarily based within the London and wider geographical area and mentioned the cost of technology as their main concern about inclusivity on socio-economic grounds. However, this view was contrary to others which suggested that the DSH programme was not reliant on technology-heavy delivery. It is worth noting that in their first year, Schoolhouses can apply for seed funding for resources that can support their work with their school communities.

**95%** of lead teachers indicated that those pupils on 'Free School Meals' were able to engage with the resources and lessons.

Over 95% of the lead teachers indicated that those pupils on 'Free School Meals' (FSM) were able to engage with the resources and lessons. No further clarification was given by the one respondent who indicated that pupils within this category did not really engage.




It is very interesting to note that the data emerging from Northern Ireland indicates that in the academic year 2019-2020 whilst the average percentage for FSM for primary schools was 25% the average for those primary schools reached through the DSH programme was 32%.

One lead teacher indicated that they:

**"have had a range of students and from experience they all get engaged."**

Esports events, tournaments and accompanying resources and activities were perceived by the lead teachers as being open to a wide audience and guest speakers were discussed as having focused on inclusivity for several characteristics. The participants reported on students' positive responses and feelings of happiness that such events and links with wider cultural sectors offer. The support by DSH and industry in supplying consoles for esports was seen as evidence of the DSH programme's suitability and accessibility by pupils from all socio-economic backgrounds.

Another respondent commented that the DSH resources are "*highly engaging for all pupils and very inclusive by design. I wouldn't say they specifically signpost equality and diversity as there isn't any reference specifically to ensuring that the resource is accessible for pupils from a diverse and inclusive background*" and continued by suggesting that a positive move forward might be to develop videos or resources which promote equality. Read about DSH esports.

# Reflections

## Lead teachers' reflections on DSH support on their role

The DSH lead teachers were asked to comment on whether they considered themselves to be supported and included in their journey as a lead teacher. 91% of the Lead teachers responded positively to this question. The qualitative data included comments like:

**"DSH have always been supportive, understanding and engaged in the journey of myself as a lead teacher and the Schoolhouse I represent. There is always somebody to connect with within the DSH community that can support and provide collaborative discussions on how to develop. I've not required anything specific personally, however, I am confident there would be active facilitation to support me and others."**

- Lead Teacher

The respondents voiced the opinion that the regular emails and constant contact through Ingenuity Days made sure that they do not feel alone. One new DSH lead teacher would appreciate for their Regional Academic Lead to accompany them to the delivery of their first lesson of the programme. While such a suggestion may be logistically difficult to organise, it may indicate that as part of their induction training day, opportunities for individual peer-led micro teaching sessions are organised. Greater use could be made of the videos already recorded by DSH as part of an ongoing professional development programme for DSH lead teachers.

Further comments on the role of the Regional Academic Lead (RAL) included "*The RAL keeps in touch and will always help out where necessary. The RAL provides me with feedback on lessons that I deliver and gives me ideas and resources that can be used in future.*"

The lead teachers recognised and praised the continuing professional development which they were receiving. One research participant described it as *"extremely supportive and inclusive."*

**"DSH have always been supportive, understanding and engaged in the journey of myself as a lead teacher"**

**"Extremely supportive and inclusive"**

**"The RAL keeps in touch and will always help out where necessary. The RAL provides me with feedback on lessons that I deliver and gives me ideas and resources that can be used in future"**

# Recommendations

It is interesting to note that 39% of the respondents made suggestions as to how DSH could further promote diversity, equality, and inclusion within the programme.

However, those who contributed to this section of the survey were not necessarily the same respondents who had highlighted aspects of diversity and inclusion which they had perceived were lacking within the programme. From a strategic perspective for future planning there were six main proposals.

### 1. Deliver teacher training on inclusivity

DSH should provide recommendations and training to the lead teachers on how to ensure that they were inclusive in their selection of schools to engage with, and when presenting the programme to the primary schools. Within this discussion two participants mentioned accessibility by some schools to having the required equipment to fully engage.

### 2. Signpost Diversity & Inclusion on website

The website should be developed to include further signposting of Diversity and Inclusion. Such signposting will enable teachers to feel more confident around Diversity and Inclusion focus. It is interesting to note that in their responses some lead teachers felt that they were not experts on Diversity and Inclusion though they are experienced practitioners, some are Heads of Department with in-depth experience on differentiation. Only one of the research participants indicated that they felt that the DSH website did not signpost diversity and inclusion clearly.

### 3. Continue to develop One Minute Mentor

One Minute Mentor (OMM) is an excellent resource that should be built on and clearer links can be made of how DSH can contribute to wider educational priorities like building computing cultural capital. OMM was praised for promoting diversity to all pupils. This was described as an example of where DSH had targeted intervention towards protected characteristics.

### 4. Further promote equality via imagery

A recommendation that came through the qualitative responses was that imagery on the resources could promote the equality agenda further.

### 5. Wider industry links

There is evidence from this study that the opportunities for exploring computing through the DSH activities and by involving wider industry links contribute to students' positive feelings and engagement. We recommend further focus on the impact on wellbeing that the programme can offer.

### 6. Contribute to the work and recommendations around promoting creativity in education

The programme can contribute further to the work and recommendations around promoting creativity in education as recommended by the Durham Commission (2021) as it provides a model for teacher professional development and inclusive access. The creativity supported by the resources, lessons and continuing professional development opportunities were positively mentioned in the focus group discussions.

We conclude this report with quotes from some of the DSH lead teachers reflecting on their engagement with the programme:


**"The [DSH] team is always introducing new ideas and is aware of the changes and needs that students and teachers raise."**

**"Access for all students, a variety of engagement levels with a focus on fun and creative learning for all pupils. Allowing all pupils to explore and engage with computers in an exciting and varied way to that of traditional teaching. Exploring through play. The resources are both plentiful and excellent."**

# Takeaways

While this report has investigated the Digital Schoolhouse programme in detail; providing inclusive educational opportunities is a key priority for anyone working within the educational space (and indeed wider afield). The research into the DSH programme has thrown up key factors to be considered when designing an opportunity to ensure it is easily accessible and equally inclusive for all participants. The following section, sets down a number of pointers that can be taken away from this report as key questions to ask when creating your own opportunities.

## Making connections, promoting identity development

- How do you support classroom learning with off-site visits, participation to events, competitions and links with the wider industry sector to inspire learners about digital technologies and future career pathways?
- How do you plan for authentic learning opportunities with a focus on social justice?
- How do you make links with feeder schools and organise events or model lessons that inspire curiosity for learning about technology?
- How do you create opportunities for cross-curricular learning tasks around moral, ethical and social uses of digital technologies?
- How do you plan for lesson observations, model lessons or provide bitesize resources to support other teachers enrich their skills on teaching computing?

## Promoting inclusive Representation & global outlook to build cultural capital

- Do the learning tasks provide opportunities to discuss equity and address stereotypes?
- How do you include local knowledge about the community the school is embedded in to customise teaching resources?
- How do you ensure diverse, inclusive representation and imagery for the learning tasks?
- How do you address stereotypes and misconceptions around computing through creative, collaborative tasks?

## Planning for access and engagement

- Can the resources and lesson activities be accessible and inclusive for learners who may rely to assistive technology for access?
- How do you cater for the possible unequal access and technology ownership students may face by planning for both unplugged and onscreen activities?
- How do you plan proactively for inclusive tasks embedding the Universal Design for Learning (UDL) principles?
- How do you plan for opportunities for learners to collaborate on problem solving tasks?
- How do you embed evidence-based inclusive pedagogies like PRIMM or pair programming?

# Thank you from Digital Schoolhouse

We would like to thank all our industry partners that continue to support the Digital Schoolhouse programme. Your generous support enables the programme to continue to reach hundreds of thousands of aspiring young creatives across the UK.

# References


Brown, N.C., Sentance, S., Crick, T. and Humphreys, S., 2014. Restart: The resurgence of computer science in UK schools. ACM Transactions on Computing Education (TOCE), 14(2), pp.1-22.

DSH Learning Remotely resources (2020) Accessed: 14/5/21 (https://www.digitalschoolhouse.org.uk/news/computing-at-home-our-top-highlights).

Durham Commission on Creativity and Education Report (2021) (https://www.dur.ac.uk/resources/creativitycommission/DurhamCommissionsecondreport-21April.pdf).

Eglash, R., Bennett, A., O'Donnell, C., Jennings, S.Cintorino, M. (2006). Culturally Situated Design Tools: Ethnocomputing from Field Site to Classroom. American Anthropologist, 108(2), pp. 347–362 (https://www.researchgate.net/profile/Ron-Eglash/publication/258198650_Culturally_Responsive_Computing_in_Urban_After-School_Contexts_Two_Approaches/links/02e7e5302d2289ea2e000000/Culturally-Responsive-Computing-in-Urban-After-School-Contexts-Two-Approaches.pdf)

Gay, J. (2002). Preparing for Culturally responsive Teaching. Journal of Teacher Education, 52 (2): 106-116 (https://www.cuyamaca.edu/about-cuyamaca-college/planning/files/equity-files/Geneva-Gay-Preparing-for-Culturally-Responsive-Teaching-2002.pdf).

Google 2014 Women Who Choose Computer Science - What Really Matters. The Critical Role of Encouragement and Exposure (https://static.googleusercontent.com/media/edu.google.com/en/pdfs/women-who-choose-what-really.pdf).

Google Inc & Gallup Inc (2016). Diversity Gaps in Computer Science: Exploring the underrepresentation of Girls, Blacks and Hispanics. (https://goo.gl/PG34aH)

Hutchinson, J., Reader, M. & Akhal, A. (2020). Education Report in England: 2020 (https://epi.org.uk/wp-content/uploads/2020/09/EPI_2020_Annual_Report_.pdf).

Ibe, N.A., Howsmon, R., Penney, L., Granor, N., DeLyser, L.A. and Wang, K., 2018, February. Reflections of a diversity, equity, and inclusion working group based on data from a national CS education program. In Proceedings of the 49th ACM Technical Symposium on Computer Science Education (pp. 711-716).

Inter-Agency and Expert Group on Sustainable Development Goal Indicators [IAEG-SDG] (2019) (https://unstats.un.org/unsd/statcom/50th-session/documents/BG-Item3a-Data-Disaggregation-E.pdf).

Israel, M., Lash, T., Ray, M. 2017. Universal Design for Learning within Computer Science Education. Creative Technology Research Lab. University of Florida.

Kemp, Wong and Berry 2019 Female Performance and Participation in Computer Science: A National Picture. ACM Transactions on Computing Education (TOCE), 20(1), 1-28. Accessed: 14/5/21 (https://dl.acm.org/doi/10.1145/3366016).

Kemp, Wong & Berry 2018 The Roehampton annual computing education report: Data from 2017 Accessed: 14/5/21 (http://milesberry.net/docs/KempWongBerry2019.pdf).

Margolis, J., Estrella, R., Goode, J., Holme, J.J. and Nao, K., 2017. Stuck in the shallow end: Education, race, and computing. Cambridge, MA: MIT Press.

Morrison, C., Villar, N., Thieme, A., Ashktorab, Z., Taysom, E., Salandin, O., Cletheroe, D., Saul, G., Blackwell, A.F., Edge, D. and Grayson, M., 2020. Torino: A tangible programming language inclusive of children with visual disabilities. Human–Computer Interaction, 35(3), pp.191-239.

National Centre for Computing Education [NCCE] (2021) Gender Balance in Computing Accessed: 16/5/21 (https://blog.teachcomputing.org/new-gender-balance-in-computing-project-announced/).

Royal Society, 2017. After the reboot: Computing education in UK schools. London: Royal Society.
Universal Design for Learning 2017 Accessed: 14/5/21 (https://www.cast.org/impact/universal-design-for-learning-udl).

# Appendix

Digital Schoolhouse (DSH) Equality Survey - Classroom Teachers

* This form will record your name, please fill your name.

1. As a DSH Lead Teacher you are invited to take part in this survey and help us gain deeper understandings around how the DSH programme supports equality, diversityand inclusion. The survey will take around 10 minutes to complete.

   It is entirely up to you whether you take part and it is optional to share your name. Ifyou do, your name or any personal identifiers will be held securely and in strict confidence with the three Regional Academic Leads who are leading this project.

   Data collected from the survey will feed into a report for DSH and Ukie. We treat this survey as part of a wider DSH research project on equality, diversity and inclusion andaim to publish the findings more widely. No individual identifiers will be included in publications.

   By completing this questionnaire, you are agreeing to take part to this study. *

   - ◯ I consent to take part in this study

2. Name (optional):

3. Length of time you have been a DSH Lead: *

   - ◯ less than 1 year
   - ◯ 1-2 year
   - ◯ 2-3 years
   - ◯ 4-5 years
   - ◯ more than 5 years

4. DSH Region you cover: *

- ◯ East Midlands (e.g. Norwich, etc)
- ◯ London and surrounding areas
- ◯ West Midlands (e.g. Birmingham, etc)
- ◯ Northern Ireland
- ◯ North East (e.g. Newcastle, etc)
- ◯ North West (e.g. Manchester, etc)
- ◯ South East (e.g. Woking, Eastbourne, etc)
- ◯ South West (e.g. Devon, etc)
- ◯ Yorkshire and Humber
- ◯ Lagos, Nigeria

5. Overall, do you consider the DSH resources appeal equally to pupils in the following groups? *

| | YES | NO |
|---|---|---|
| Disability | ◯ | ◯ |
| Ethnicity/Race | ◯ | ◯ |
| Gender | ◯ | ◯ |
| Socio-economic inequality | ◯ | ◯ |

6. List the top THREE DSH resources you feel best demonstrate an equality, diversity &inclusion focus?
Please reflect in terms of all protected characteristics (e.g. Disability, Gender, Ethnicity/Race, socio-economic inequality, etc).

*Please reflect in terms of all protected characteristics (e.g. disability, gender, ethnicity/race, socio-economicinequality, etc).*

7. If you answered NO to Questions 5 and 6, please give us your key reasons for yourresponse.

8. Why did you choose those THREE resources as the most representative for equality, diversity, and inclusion?

9. Are there ways that DSH resources can promote further diversity, equality & inclusion? *

- ◯ YES
- ◯ NO
- ◯ NOT SURE

10. List your top THREE suggestions of how DSH resources can further promote diversity,equality & inclusion. *

11. Do you feel that the DSH website signposts diversity and inclusion clearly? *

- ◯ Yes
- ◯ No
- ◯ Not sure

12. Please, justify your answer. *

13. Overall, during your DSH lessons/events, how do you feel the following groups of pupils have engaged? *

| | A LOT REALLY | SOMETIMES | NOT |
|---|---|---|---|
| pupils with SEN-D | ◯ | ◯ | ◯ |
| female pupils | ◯ | ◯ | ◯ |
| ethnic minority pupils | ◯ | ◯ | ◯ |
| pupils on Free School Meals (FSM) | ◯ | ◯ | ◯ |

14. With reference to your DSH work, add any other comments regarding equality, diversityand inclusion.

15. Do you feel that DSH is supportive and inclusive in your journey as a Lead Teacher? *

- ◯ YES
- ◯ NO

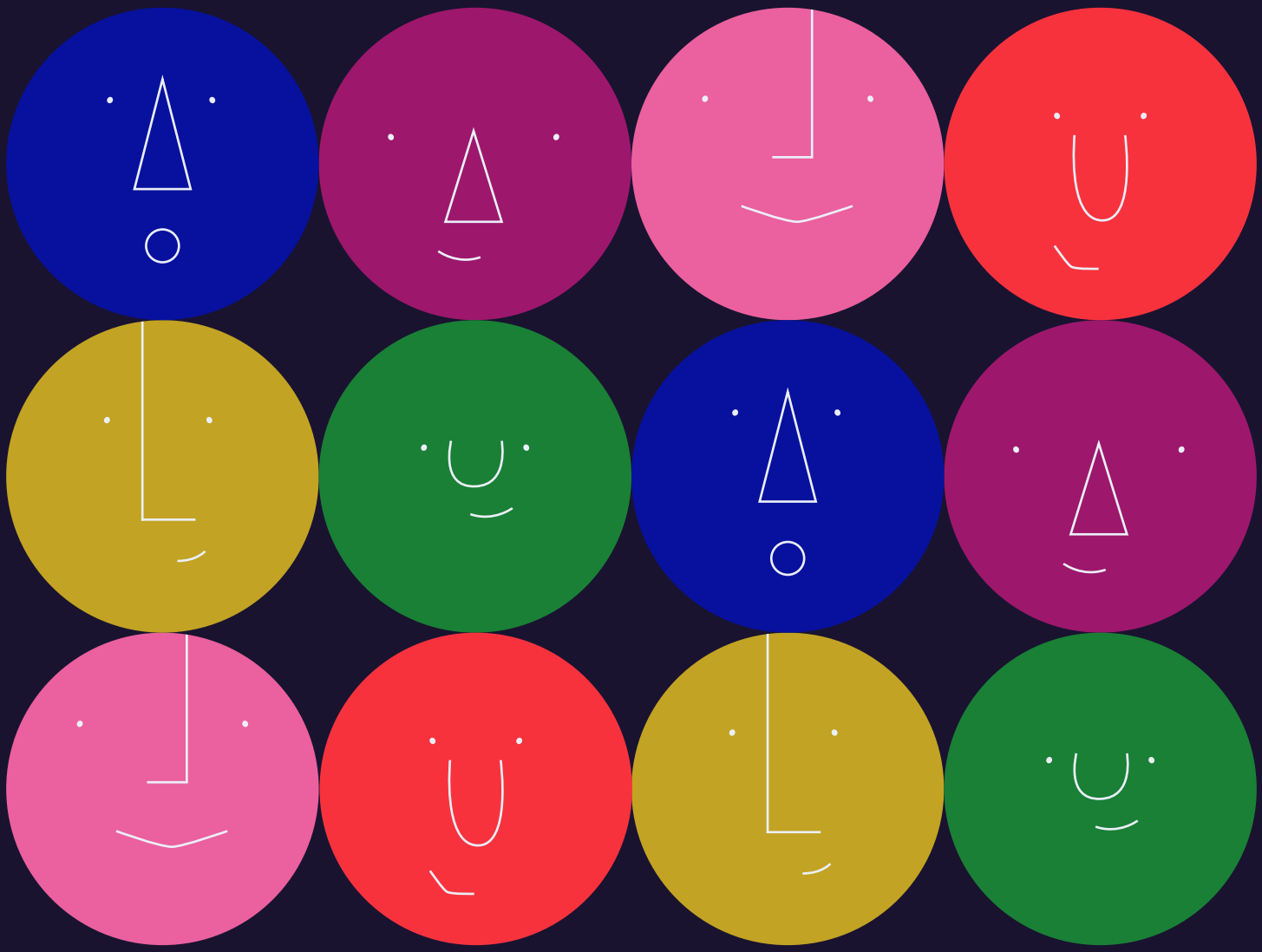
16. Please, elaborate on the reasons behind your response. *

# Table 1

## Initiatives to Address the Gender Imbalance

| Initiative | Organisation | Approaches | | | | Comments |
|---|---|---|---|---|---|---|
| | | SE | SP | AE | CP | |
| CyberFirst Girls Competition (https://www.ncsc.gov.uk/cyberfirst/girls-competition) | National Cyber Security Centre (NCSC) | ü | ü | ü | ü | The aim of this girls only knockout competition is to inspire female learners to consider a career in cybersecurity. Female learners compete in teams to solve increasingly more sophisticated cybersecurity challenges. In 2020, 11,900 female learners competed in the CyberFirst Girls Competition (). |
| Digital Schoolhouse | Ukie | ü | ü | ü | ü | Digital Schoolhouse teachers deliver sessions to whole primary classes. Thus introducing female learners to concepts and principles of computer science. |
| The *Gender* Balance in Computing (GBIC) research programme (https://teachcomputing.org/gender-balance) | National Centre for Computing Education (NCCE) | ü | ü | ü | ü | This is a four-year project carrying out six interventions to determine what works to encourage female learners to further study computer science. Currently, it is in the second year of its project cycle. |

**Key**: **SE**: **S**ocial **E**ngagement, **SP**: **S**elf-**P**erception, **AE**: **A**cademic **E**xposure and **CP**: **C**areer **P**erception



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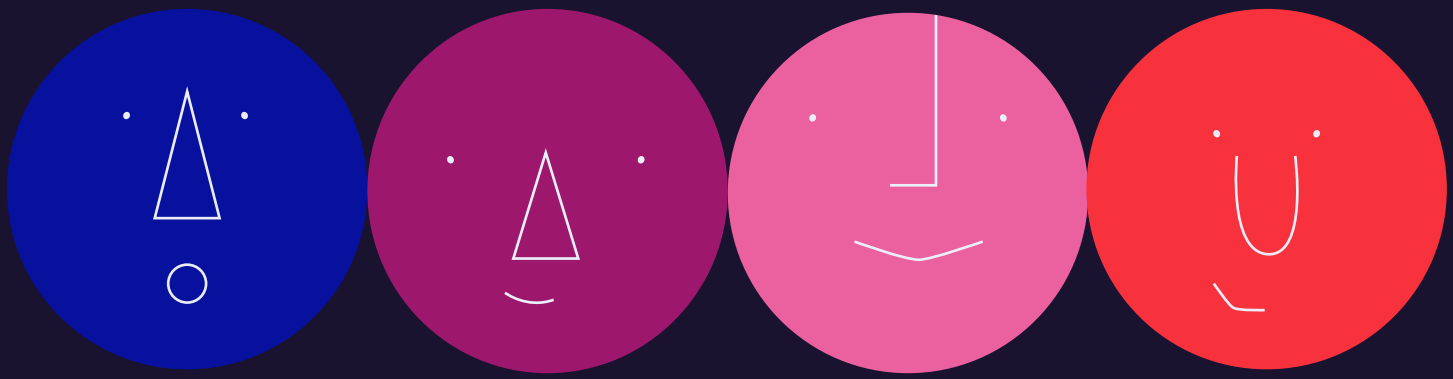

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