Seeing and believing:
diversity, inclusion and access in computing education

February 2025

Executive summary

The National Centre for Computing Education (NCCE), delivered by STEM Learning, convened a roundtable to discuss how to ensure equitable access to digital and computing education for all young people and enhance diversity in the technology workforce. The event brought together representatives from industry, government, and education sectors to explore this topic. This paper provides an overview of the discussions that took place during the roundtable and draws out the key recommendations.

Key themes

1. Role models and representation

- **Diverse role models:** The importance of relatable and diverse role models in inspiring young people to pursue careers in technology was emphasised. Industry should support initiatives like Computing Ambassadors, delivered through the STEM Ambassadors programme, that provide volunteering opportunities and training for staff to engage with students.

- **Broadening STEM roles:** A wider interpretation of STEM careers to demonstrate a wide range of jobs available within STEM industries would be helpful, including business administration and project management roles with STEM organisation crucial to their operations.

2. Industry collaboration

- **Knowledge sharing and cross-industry initiatives:** Companies already engaged in technology education should share their expertise with other businesses. Additionally, developing cross-industry resources and initiatives can help scale up efforts to support young people, which could benefit areas with a higher concentration of small and medium enterprises (SMEs).

- **Support from the government:** Government should support industry with their efforts to develop cross-sector initiatives that help young people to consider careers in STEM.

3. Support networks

- **Support networks:** Creating networks to support young people, especially those with Special Educational Needs and Disabilities (SEND), and facilitating connections across multiple schools would be hugely beneficial.

- **Digital hubs:** Technology firms should establish digital hubs and engage with parents and communities to provide supportive environments for skills development.

4. School resources and teacher support

- **Specialist teachers:** Addressing the shortage of specialised computing teachers through funding, training, and support to ensure those delivering the curriculum are empowered to do so in an inclusive way should be a priority.

- **Continuing Professional Development (CPD):** Government and industry should champion face-to-face CPD for teachers, and schools should allocate time for staff to participate in these activities as they are the most impactful when it comes to teacher confidence and improved classroom practice.

- **Sustainable initiatives:** To ensure sustainable, long-term impact, STEM initiatives should be institutionally driven, with dedicated STEM roles within schools coordinating industry support and ensuring its continued viability.

5. Curriculum development

- **Inclusive curriculum:** Basic computing skills and digital literacy should be embedded throughout the curriculum. Additionally, a review of curriculum should ensure that is accessible and inclusive, particularly for SEND students and those from disadvantaged backgrounds.

- **Real-world applications:** Contextualising learning to real-world issues and incorporating mandatory work experience at key stage 4, with industry providing pastoral support would provide greater opportunities for all young people.

6. Parental involvement

- **Upskilling parents:** Digital skills training for parents to better support their children's education should be introduced. There should also be greater mechanisms to address unconscious biases and encourage parents to realise the importance of computing education.

Recommendations

For industry

- Increase support for STEM Ambassador programmes (including Computing Ambassadors), broaden the interpretation of STEM roles and better showcase skills and competencies valued within STEM organisations.

- Work with other businesses on developing resources and strategies to engage with students, and share knowledge and expertise with others on how to best support young people.

- Establish digital hubs and engage with local communities and provide more work experience opportunities.

For government

- Provide funding and support for subject-specific CPD.

- Ensure more investment is made available for ongoing support in schools.

- Support the integration of basic computing skills and digital literacy throughout the curriculum, and broaden the current Computer Science GCSE qualification to include the assessment of broader digital skills.

For educators

- Ensure STEM initiatives are driven by schools rather than falling to individual volunteers and provide support and resources to those coordinating initiatives.

- Use the STEM Ambassador programme to provide young people with role models and support with careers education.

- Engage with CPD opportunities to develop skills and knowledge to feel empowered to deliver and contextualise the curriculum in an inclusive manner that can also bring real-world learning into the classroom.

- Engage with the development of networks to support young people, especially those with Special Educational Needs and Disabilities.

STEM Learning will continue to champion activities in this space as well as the implementation of these recommendations to support opportunities for all young people, ensuring they have equitable access to digital and computing education and can thrive in a diverse and inclusive technology workforce.

Key discussion points

Role models

The roundtable discussion highlighted the power of relatable and diverse role models in inspiring young people to pursue careers in the technology sector. Participants emphasised the importance of engaging young people with figures from the technology industry who they can relate to, while cautioning against making assumptions about what will inspire each individual young person. Diverse role models are essential in showing that technology career paths are accessible and achievable for everyone. Two key concepts emerged: "Seeing" and "Believing." Students need to see someone they can relate to in a technology career and understand the routes into that career, and someone to give them creative opportunities, believe in their abilities, and encourage them.

A recurring theme from participants was the limited exposure young people have to those working in high-skilled jobs in STEM fields, often leading them to be unaware of careers to which they can aspire. This also creates misconceptions about technology careers, including the roles, people, and routes into the industry. Students often picture middle-aged white men working in isolation, which does not reflect the diversity of the technology workforce, or ambitions to create a more diverse workforce of the future. Educators noted the invaluable impact

of initiatives they have been part of to engage particular groups of young people, including SEND and girls, and how having people from industry in the classroom was a real way for pupils to "see" themselves in such careers.

Interactions with diverse role models from industry through programmes such as STEM (and Computing) Ambassadors can help change these perceptions. This requires greater support from technology companies who must mobilise and support their staff to work with young people through offering more volunteering days for their staff to act as STEM Ambassadors (whilst avoiding tokenism), and training for those working with children on using appropriate language is also important. Organisations should also be broader in their interpretation of what it means to work in STEM and encourage a wider section of their workforce to become STEM Ambassadors. For example, roles such as business administration and project management in STEM firms should be recognised and showcased to students as viable STEM careers.

Whilst technology companies must place STEM education and Equity, Diversity, and Inclusion (EDI) initiatives at the forefront, participants recognised other challenges and opportunities for industry in this space. For example, companies already engaged in technology education should share their knowledge with other businesses interested in supporting young people but unsure how to proceed. Further support may also be needed in geographical locations where there is a stronger make up of small and medium enterprises (SMEs), who may, despite their willingness to support, struggle to release staff to inspire young people in their area. A potential solution that was recommended for this, and to strengthen existing initiatives, is a cross-industry approach to creating resources and ideas for working with young people, allowing for a scalable and unified model. To support industry, government support for such national-scale approaches is necessary, and government has the power to widen the impact through not only legislating in support of accessibility, but also highlighting and championing the social impact of working with young people when awarding contracts to businesses.

Networks

The roundtable discussion highlighted the importance of networks in supporting young people, particularly those with Special Educational Needs and Disabilities (SEND), but is applicable to all groups of young people. Participants suggested how young people with SEND need to find their "tribe", but this can be challenging as these tribes often disappear at each transition point in their education. This discussion more widely included the need for networks to support young people, including those from state schools and disadvantaged backgrounds.

These networks can provide essential support and opportunities that might otherwise be inaccessible, and offer young people the chance to meet like-minded peers and support each other. This sense of community can be difficult to find unless initiatives are set up to facilitate these connections, which may need to span across multiple schools rather than existing in isolation. Stronger networks that support young people would be very powerful throughout their educational and career journeys, ensuring they have the resources and role models they need to "see" and "believe", including their peers.

One suggestion was for technology firms to create digital hubs and engage parents and communities, providing supportive environments for young people to explore and develop their technology skills. This would also create an opportunity for greater connections between technology companies and the schools in their area, allowing them to provide meaningful support to groups of local young people whilst also serving to offer role models to the future pipeline of talent in their locality.

School resources

The roundtable discussion highlighted the barriers for schools in offering an inclusive computing education offer. It was widely agreed that schools are balancing numerous priorities, so greater support from both industry and government is crucial to ensure computing education receives the attention it deserves. A couple of barriers identified were the lack of specialised teachers, and time available for staff to support initiatives relating to diversity and inclusion. Educators described how it is often the case that non-specialist teachers are required to teach computing without the in-depth curriculum knowledge, owing both to the challenges with recruiting teachers to the profession and then retaining them.

Funding, training, and support for teachers are essential, and schools can often be wary of running programmes and initiatives they do not feel knowledgeable about. This may lead to perceptions that opportunities are not suitable for their students, which may disproportionately affect young people in disadvantaged communities where teaching retention rates are lower. The importance of face-to-face Continuing Professional Development (CPD) for teachers was highlighted, with a recommendation for the government to support this, industry to champion it, and STEM Learning to continue to build and deliver high-quality CPD, through the National Centre for Computing Education (NCCE). Schools should also allow their teachers opportunities and time to participate in CPD, especially in a face-to-face

setting, to create confident educators, which can support retention and improve outcomes for pupils.

The withdrawal of funding for Computing Hubs was seen as a significant concern for supporting staff to be upskilled and able to provide an inclusive computing education offer, particularly as these Hubs delivered crucial face-to-face and remote CPD and physical resources for teachers in their local areas. The loss of funding will have a significant impact, especially in education priority areas. There was a strong recommendation for the government to reconsider future funding in this area so that schools, teachers and young people receive the appropriate support needed with respect to computing education. As the NCCE will continue to deliver CPD, with more online opportunities available, schools should continue to support their staff to engage with these activities.

Participants also noted that STEM initiatives in schools often rely on the drive of individual teachers or staff, and these efforts can cease when individuals leave. There needs to be an institutional drive in schools to ensure sustainability, rather than placing all the weight on individuals. It was also suggested that those running STEM activities in schools are often volunteering their time outside of core responsibilities. Schools need dedicated roles to work with industry and create a STEM 'buzz' to ensure that these initiatives are prioritised and those running them are given sufficient resources to do so.

Local initiatives, such as Dorset Council's 'coding day', can bring communities of schools together to raise engagement with computing and inspire students. These events require active engagement from schools and support from organisers. The NCCE can continue to run similar events, and support local initiatives, but industry support remains necessary to make them successful.

Finally, there is a need to support those giving careers advice in schools to encourage young people to explore opportunities in the technology industry. This should start from primary education stage to support early interventions, and STEM Ambassadors can play a vital role in providing careers support and raising awareness of the opportunities available in the technology sector.

Curriculum

The roundtable discussion emphasised the need for a comprehensive and inclusive approach to the curriculum in computing education. A significant issue identified was the absence of basic ICT skills, which are fundamental to computing. This gap may stem from the loss of ICT as a standalone subject, leading to industry having to compensate by providing support on basic digital aspects such as sending emails and opening files. STEM Learning continues to support this view, and encourages a move to a Computing GCSE which covers all aspects of computing more broadly as part of the curriculum and assessment review being undertaken by the Department for Education.

It was also strongly recommended that digital skills be embedded throughout the curriculum at every stage and in every subject to make learning more intuitive. This approach ensures that all students, regardless of their background, have the opportunity to develop essential digital skills. Integrating these skills into all qualifications and ensuring teachers are aware of and can effectively use available resources is crucial.
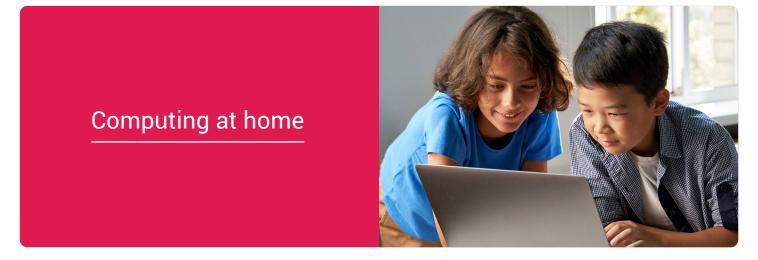
The discussion also highlighted the need for a curriculum that incorporates real-world needs and is accessible and inclusive, particularly for students with Special Educational Needs and Disabilities (SEND), as well as those from disadvantaged backgrounds. Integrating technology into other subjects can help achieve this inclusivity alongside contextualising learning to community-related issues, such as high air pollution, was seen as important to demonstrate how technology can solve real-world problems. It was also recognised that whilst these young people we are supporting in schools may not have created some of the issues facing the world today, it is important that they develop awareness of them and feel empowered to develop solutions to tackle them.

It was noted in the roundtable that young people with SEND may excel in computing even when they struggle with English and maths. Attending digital competitions and enrichment activities can significantly build their aspirations, and these would also provide a platform for more opportunities for industry to engage with schools.

The curriculum should be complemented with mandatory, meaningful work experience at key stage 4. Industry needs to support this by providing pastoral support and considering how to scale their models to accommodate more student placements. Businesses can also encourage the development of wider skills through interactions and work experience, for example technology education can also foster entrepreneurial skills.

Finally, it was recognised that schools tend to focus on subjects where they are held accountable. In a system where so much emphasis is place on accountability, schools should be given greater freedom to prioritise what is important for the young people they support. Government should continue to consider any perverse effects that accountability measures create on the opportunities that schools are able to offer to their students.

Computing at home

The roundtable discussion highlighted the crucial role parents play in supporting their children's computing education. However, it was noted that parents may often lack the digital skills necessary to effectively support their children. This discussion is particularly timely given the recent unveiling of the Digital Inclusion Action Plan by the Department for Science, Innovation and Technology.

Inclusion of upskilling initiatives for parents is essential. Initiatives like Sure Start which aimed to provide early support and resources for families are increasingly important. By providing parents with the necessary digital skills, they would be better equipped to assist their children with their computing education. Additionally, it is important to address and mitigate any unconscious biases parents may have regarding computing as a subject or technology careers for their children. Educating

and reassuring parents about the viability and importance of computing education is crucial. Participants reported the lack of confidence that parents have in schools' abilities to teach computer science to all genders, highlighting the need for greater parental education and involvement.

In areas where a proportion of the population live in social housing, and/or may be digitally excluded,, significant barriers exist. These barriers are compounded by limited access to technology in many households, with families often relying on a single device, such as a parent's smartphone, for all their digital needs. This limited access can hinder both students' and parents' ability to engage fully with computing education.

Recommendations

For industry

1. **Support diverse role models:** Increase support for initiatives like STEM (and Computing) Ambassadors, enabling staff to undertake volunteering opportunities and training to engage with students.

2. **Broaden STEM roles:** Encouraging a wider interpretation of STEM careers and a wide range of jobs available within STEM industries.

3. **Knowledge sharing:** Share expertise with other businesses on how to best support young people.

4. **Cross-industry initiatives:** Develop scalable, cross-industry resources and ideas for working with young people.

5. **Digital hubs:** Establish digital hubs and engage with parents and communities to provide supportive environments for skills development.

6. **Support work experience:** Provide pastoral support and consider how to scale models to accommodate more student placements.

For government

1. **Funding for specialist teachers:** Provide funding and support for the recruitment, training, and retention of specialist computing teachers.

2. **Support for CPD:** Champion and fund face-to-face CPD for teachers and ensure schools allocate time for staff participation.

3. **Support to schools:** Ensure ongoing support for computing including CPD and resources in schools.

4. **Curriculum and assessment review:** Support the integration of basic computing skills and digital literacy throughout the curriculum.

5. **Highlight social impact:** Emphasise the social impact of working with young people when awarding contracts or funding to organisations.

6. **Upskill parents:** Work with stakeholders on offering digital skills training for parents to better support their children's education and address unconscious biases.

For educators

1. **Sustainable STEM initiatives:** Ensure STEM initiatives are institutionally driven and not reliant on individual teachers and provide appropriate support and resources to those leading initiatives. This includes bringing STEM Ambassadors into schools to provide young people with industry role models.

2. **Engage with CPD:** Support school staff to engage with CPD opportunities to develop their skills and feel empowered to deliver the curriculum in an inclusive way.

3. **Foster support networks:** Engage with the development of networks ("tribes") to support young people, especially those with Special Educational Needs and Disabilities (SEND).

4. **Integrate digital skills:** Embed digital skills throughout the curriculum and ensure teachers are aware of and can effectively use available resources.

5. **Real-world learning:** Contextualise learning to real-world issues and work with industry to provide meaningful work experience placements at Key Stage 4.

6. **Career support:** Provide careers advice starting from primary school and utilise STEM Ambassadors to raise awareness of opportunities in the technology sector.

The expertise and participation of all attendees during the roundtable was greatly valued, including senior representation from Adobe EMEA, BAE Systems, Cisco, Department for Education, Dorset Council, Fulford School York, Great Places Housing Group, Lightyear Foundation, Next Level Edu, UK Black Tech, WISE, Westminster Primary School Birmingham, and techUK.

STEM Learning, through the National Centre for Computing Education, is dedicated to working closely with our partners to bring these recommendations to fruition. By continuing our collaboration with industry, government, and educators, we aim to ensure that every young person has the opportunity to engage with digital and computing education.