COUNCIL FOR SCIENCE AND TECHNOLOGY

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1 December 2020

Dear Prime Minister

Improving educational outcomes for learners with specific learning difficulties

When you met with the Council in March, you asked us to consider how science and technology could help unleash the potential of every child across the country. Educational attainment is a critical factor influencing a learner's future life chances and we welcome your pledge that every child should be able to access the education that is right for them.

Following our letter in September on how science and technology can be used to tackle regional disparities, we are writing to offer advice on science and technology for improving learning, particularly for learners with specific learning difficulties (SpLDs) such as those with dyslexia or dyscalculia. This term refers to a difference or difficulty with aspects of learning that affect the way information is perceived and processed (distinct from overall intelligence or cognitive ability). We have focused on learners with SpLDs as a lens to understand how insights from disciplines such as neuroscience and psychology are being applied in the educational system, including the development of evidence-based educational technologies to support the needs of all learners[1]. Many of the issues we have identified may be relevant to supporting other learners.

We welcome the Government's strategy for education providers and the technology industry to help improve and increase the effective use of technology in education (Realising the potential of technology in education, April 2019) and the Government's review announced in September 2019 to evaluate support for children with additional needs[2,3]. This advice is intended to contribute to the review.

The life chances of children and young people are strongly affected by their attainment and achievement in their early years and at school. Key skills such as numeracy and literacy have a positive effect on employment and earnings for the individual, as well as a wider correlation

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[1] We have focused on SpLDs with a cognitive rather than behavioural basis such as dyscalculia and dyslexia. We have not reviewed autism or ADHD in depth.
[2] https://www.gov.uk/government/news/major-review-into-support-for-children-with-special-educational-needs
[3] According to DfE statistics (January 2020), 15.4% of children in England currently receive formalised support for Special Educational Needs (SEN) through either SEN Support or an EHC plan.

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with economic and social outcomes. Cognitive deficits (an impairment in an individual's mental processes that influence how information and knowledge are acquired) can lead to failure to learn key skills effectively. Contemporary studies estimate the prevalence of common specific learning difficulties such as dyslexia and dyscalculia as 5-10% and 4-7% respectively. Studies in psychology, cognitive neuroscience and education have begun to uncover the root causes of, and potential methods to address, these cognitive issues.

We looked across the last decade to consider how developments in science and technology have advanced understanding of specific learning difficulties and what evidence-based interventions are now available. We found that more could be done to:

- Translate what is already known into practical tools and support for learners through better connection between the research community, educational professionals, and the Education Technology (EdTech) industry.

- Improve learner access to evidence-based support, through clarity on definitions of learners who could benefit from support, ensuring equality of access to support across the country, and boosting awareness, understanding and skills for those who deliver support, namely teachers, school leaders, and parents or carers.

We offer six recommendations to improve research co-ordination and to develop and pull through educational interventions to support individuals with specific learning difficulties, whilst broadening the use of evidenced approaches to enhance outcomes for all.

In particular, we endorse the proposal of the Royal Society and British Academy to establish an Office for Educational Research to coordinate efforts to better meet current and future research needs and complement the work of the Education Endowment Foundation (EEF) in this area. Below, we suggest some priority objectives for such a centre. We also propose actions that the Department for Education, working with public sector partners, could take to ensure an evidence-based approach to the uptake and evaluation of learning technologies.

Our recommendations in this area are as follows:

1. DfE should work with the British Psychological Society to standardise criteria for official recognition for all SpLDs to ensure all learners with SpLDs can be recognised and that their individual needs for support assessed.

2. DfE should ensure that there is clear, evidence-based national guidance on the use of EdTech products to assist the learning of children with SpLDs. This guidance could be provided through the EEF or a new body.

3. DfE should work with leaders of the teaching profession and universities to adapt teacher training avenues, CPD and support networks to ensure that teachers have an adequate understanding of SpLDs and the interventions available to support these learners.

4. DfE should work with UKRI, Nesta and EEF to develop a new Education Technology Challenge (ETC) programme to focus research and innovation activity on delivering effective evidence-based interventions to support all learners with SpLDs.

5. DfE and UKRI, working with practitioners, EEF and other organisations, should consider steps needed to ensure research is coordinated to better meet current and

future needs relating to SpLDs. This could form part of the remit of the Office for Education Research recommended by the Royal Society and British Academy.

6. DfE should work with the research and practitioner communities to identify where further information or data is needed to improve identification of groups of learners who would benefit from special support, whilst encouraging consistent data collection and improving access to data.

Finally, we offer a reflection on the school closures in response to the Covid-19 outbreak and the rapid deployment and increasing reliance on digital technologies to support learning. Transferring learning to the home environment during this period has been a major test of online educational resources and of the equipment, digital infrastructure, and skills needed by pupils, parents, and teachers to enable effective learning outside the classroom.

Digital access is increasingly seen as fundamental for educational attainment. Given the potential for further school closures and pupils to self-isolate to manage the pandemic, there is an urgent need to bring together evidence to evaluate what works and inform policy development to ensure equality of access and appropriate support for all learners. There may be valuable experience to share between different parts of the education system to help inform choices being made by schools about technologies. In the longer term it will be imperative to reflect on and evaluate this experience to identify best practice, promote inclusivity, support effective teaching and to target future investment in the education system.

We are grateful to CST subgroup members Max Lu, Philip Bond, Ottoline Leyser, Jim Hall and Keith Burnett for their work developing the recommendations. We would like to thank Maggie Snowling, Usha Goswami, Peter Halligan, Julia Carroll, Helen Ross, Rose Luckin, Diana Laurillard and Brian Butterworth, and other experts from the academia, technology and educational sector for sharing their expertise to inform development of the Council's advice.

We would be delighted to discuss in more detail with you or your Ministerial colleagues.
This letter is copied to the Secretary of State for Education; Secretary of State for Health and Social Care; Secretary of State for Business, Energy and Industrial Strategy; the Permanent Secretaries of those Departments, and the Cabinet Secretary.

Yours sincerely,

Sir Patrick Vallance   **Professor Dame Nancy Rothwell**
(Co-Chair)   **(Co-Chair)**

PRIME MINISTER'S COUNCIL FOR SCIENCE AND TECHNOLOGY

Improving educational outcomes for learners with specific learning difficulties

1. Improving educational attainment, particularly for those from disadvantaged backgrounds or with learning difficulties, will enhance social inclusion and employment prospects for individuals and will contribute to the UK's economic growth and wellbeing.

   a. Economic impact analysis conducted by KPMG estimated the long-term cost to the nation of the lowest 6% in maths (below UK entry level 3) at £2.4 billion p.a. (2009 prices) in education, taxation, social, health and crime. The estimated return on £1 spent on extra education is at least £12.

   b. OECD modelling shows that raising the attainment of the UK population above PISA level 1 would result in an average annual economic growth rate increase of 0.44%[4].

   c. According to DfE, improved skills have contributed somewhere between one-tenth and one-quarter to annual UK growth since the 1970s; but a lack of skills accounts for up to 13% of the UK's productivity gap with France, and 29% of our productivity gap with Germany[5].

   d. People with poor literacy skills are more likely to be unemployed, have low incomes and poor health behaviours, which in turn can be linked to lower life expectancy[6].

2. Our advice is concerned with how to support individuals with specific learning difficulties to fulfil their potential[7]. However, there are also advantages to application of science and technology to improve the educational environment for all learners, with even wider benefits for our society and the economy in the long term.

3. A core element of the recommendations involves identifying how the process of provision for SpLDs could be improved, by addressing institutional barriers and disconnects. This can be visualised as part of a 'learner-centred journey' from diagnosis, assessment of needs and provision of relevant support, ongoing development and changing needs throughout schooling, transition to FE/HE and/or employment. (**Annex A**). Our recommendations cover key systems issues in the educational context:

   - Reducing regional inequalities in access to support
   - Improving evidence-based evaluation of interventions
   - Enhancing teacher training avenues to support learners with SpLDs
   - Incentivising collaboration between researchers, software developers and EdTech providers
   - Encouraging co-design of interventions between EdTech developers, teaching professionals, learners, and parents
   - Improving data collection and availability to identify learners in need of support and evaluate the effectiveness of interventions

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[4] https://www.oecd.org/pisa/44417824.pdf
[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/508421/DfE-strategy-narrative.pdf
[6] National Literacy Trust 2018 https://literacytrust.org.uk/research-services/research-reports/literacy-and-life-expectancy/
[7] In this review we have considered advances in science and technology that have occurred over the last decade since previous major education reviews in this area e.g. Foresight report on Mental Capital and Wellbeing (Goswami, 2008), Independent Review of the Primary Curriculum (Rose, 2009). Here we focus on SpLDs with a neuro-cognitive basis, with common SpLDs in this category including Dyslexia, Dyspraxia, Dyscalculia, and Dysgraphia.

Issue: There is a disparity between local authority approaches to recognition of SpLDs, leading to a "postcode lottery" of support for learners.

4. Special Educational Needs (SEN) vary widely and different learning difficulties within SEN are poorly defined. As a result, different local authorities vary in the rates of needs identification and support they provide, especially for non-medically recognised specific learning difficulties. Clear definitions can alleviate this problem, improve the quality of data collected and support research to understand the prevalence of SEN and effectiveness of interventions.

5. Both the Education Select Committee[8] and the National Audit Office[9] have highlighted the issue of regional disparity in support. It is imperative that high-quality support is available across the country, which is consistent across local authorities and joined up across health, care and education services.

6. Different actors identify learners with SpLDs in alternative ways, leading to increased disparities in provision of support. For example, whilst schools use needs-based identification methods, universities and employers require a formal diagnosis, and health services use 'identification pathways' (**Annex A**). This is further complicated by disparities between how researchers identify learners with an SpLD (e.g. neuroscientists will often use differences in cognition) and how educational psychologists (governed by the British Psychological Society) and teachers approach identification (e.g. primarily assessed through differences in learner behaviour).

Recommendation 1: DfE should work with the British Psychological Society to standardise criteria for official recognition for all SpLDs to ensure all learners with SpLDs can be recognised and that their individual needs for support assessed

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7. For example, we note the relative lack of recognition, identification, and diagnosis for dyscalculia in the UK, even though the condition is well defined and its behavioural characteristics are generally agreed on. Official government recognition will help policymakers, parents, and schools to act. Other G7 nations, including the USA and Italy, have laws requiring intervention for dyscalculia.

8. Currently, there are large disparities between different local authorities in the proportion of students labelled with different SEN, which then impacts the support those learners receive. The aim should be to establish evidence-based guidance and advice at a national level on how to assess learners, establish the case for support, and determine what support would best meet the individual's needs to ensure consistency across local authorities.

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[8] https://publications.parliament.uk/pa/cm5801/cmselect/cmpubacc/85/8502.htm
[9] https://www.nao.org.uk/report/support-for-pupils-with-special-educational-needs-and-disabilities/

9. Government policy leaves decisions on the best interventions to support learners at the discretion of individual schools and teachers. Teachers need an assessment that will guide practical action to support the individual, and it is crucial that decision makers (e.g. teachers, school leaders) are empowered to evaluate the best support options to meet learner's specific needs whilst taking into account the learning environment.

10. There is an opportunity to develop improved tools to help educational psychologists and teachers to identify learners and their specific support needs. These span cognitive assessments for issues with co-ordination, attention, visual processing and auditory processing, which may be cognitive or non-cognitive in origin.

Issue: There is a lack of consistent guidance around the use of technology to support learners with SpLDs.

11. The current system for selecting the best available interventions and putting them into practice presents numerous difficulties, including:

    a. The pressure on teachers to deliver immediate results in the education landscape restricts innovation.

    b. The lack of quality control surrounding the methodology, data collection and analysis of interventions makes it difficult for education practitioners to properly evaluate options. For example, EEF evaluate a selection of educational interventions which are brought to them by industry using high-quality Randomised Control Trials (RCTs), whilst other EdTech companies offer products which have little evidence of efficacy but are still popular due to features such as ease of use, low price points, or how engaging they are.

    c. School and exam board policies often inadvertently restrict the use of supportive technologies in schools (e.g. students who rely on technology in the classroom may be unable to 'reasonably adjust' materials in exams congruent with their normal way of working).

12. We have identified four barriers to accessing evidence-based tools and support for learners.

    a. Although the EdTech sector in the UK is strong and rapidly growing[10] it is not sufficiently **connected** to the research community or the evidence base to ensure increasing uptake to technology in schools fulfils the promise of both improving accessibility and improving student outcomes.

    b. Weak **demand** for EdTech products that support learners with SpLDs - There are researchers with ideas for interventions, but these are not being developed into high quality applications to test in schools. Individual schools have a limited budget and need products that work for all learners.

    c. **Asymmetric information** in the EdTech market - Access to, and feedback from, school-based evaluation (for both researchers and tech companies) is lacking, and evidence of impact is not always available to schools when purchasing technology.

    d. No way to **evaluate** the effects of interventions on learners in a classroom environment at scale – The EdTech market lacks a standardised method/source for

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[10] https://technation.io/news/british-edtech-helping-schools-teachers-online-learning/

evaluating interventions, leading to an environment where schools are overwhelmed by options and no clear distinction between those with proven efficacy.

13. We welcome the emphasis in the Government's 2019 EdTech Strategy[11] to build a wider evidence base on the effectiveness of EdTech products and services and help educators understand what technology to buy to meet specific needs and to get the best price. We welcome the strong focus in **developing digital capability and skills** (Chapter 3) and **supporting effective procurement** (Chapter 4).

Assessing impact

14. Charities such as EEF, Wellcome Trust and Nuffield Foundation play an important role in gathering evidence on educational interventions. A specific aspect of EEF's role is **generating new evidence of 'what works' to improve teaching and learning** including funding independent evaluations of high potential interventions. However, there are challenges with the current model:

    a. The EdTech sector is expanding rapidly and expected to be worth over £3bn in the UK alone by 2021. RCTs require a significant amount of time and resources. EEF has finite resource and could not provide this kind of 'gold standard' assessment for every product being marketed as supporting learning.

    b. Interventions completing this process often display small effect size and intervention success can vary significantly depending on the demographic of students and the environment in which they are learning. EEF offers a broad assessment of digital technologies in its Teaching and Learning toolkit[12] but recognises effective use of digital technology will be driven by learning and teaching goals rather than a specific technology.

    c. Due to intellectual property rights, it is only possible for EEF to test the efficacy of interventions that are brought to them by suppliers. There is little incentive for suppliers to go through this process as it does not improve their ability to sell their products on the market.

    d. EEF has a focus on learning in a school environment. The use of online e-learning systems has grown considerably over recent years and became important during recent school closures as part of managing the COVID outbreak, but few studies investigate their accessibility for persons with cognitive impairments[13]. Given the rapid shift to e-learning, more research is needed into the effectiveness of e-learning approaches.

15. The Welsh Government's guide on assistive technology[14] provides an excellent introductory guide to the role of technology within a well-constructed support programme. However, centralised government guidance is unlikely to be able to keep pace with specific products coming on to the market.

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[11] https://www.gov.uk/government/publications/realising-the-potential-of-technology-in-education
[12] https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/digital-technology/
[13] Online e-learning and cognitive disabilities: A systematic review, Pierre-Antoine CINQUIN, Pascal GUITTON and Hélène SAUZÉON DOI: 10.1016/j.compedu.2018.12.004 https://oskar-bordeaux.fr/bitstream/20.500.12278/7905/1/BPH_ComputersEducation_Cinquin_2018.pdf
[14] https://gov.wales/sites/default/files/publications/2018-03/assistive-technology-guidance-for-teaching-practitioners-to-support-learners-with-specific-learning-difficulties.pdf

<u>Meeting the needs of learners</u>

16. The most successful interventions to support learners with SpLDs do not always involve technology[15], with reviews of the area suggesting educational software applications currently on market may not be appropriate for the learning environment of learners with SpLDs and SEN more broadly[16]. However, the evidence we have reviewed suggests that digital technologies and applications offer new opportunities to deliver tailored support, build in features to identify learners with SpLDs, and monitor efficacy of interventions. For example, a recent AI-based app Dytective developed by Carnegie Mellon University computer scientists to support children affected by dyslexia, has won the UNESCO ICT Award[17]. The machine learning model used within the Dytective game was shown to predict dyslexia with 83% accuracy.

17. To enable stakeholders to compare the efficacy of interventions on the academic attainment of SEN students a **standardised data collection methodology and ontology** (e.g. that being developed by UCL EDUCATE) will be required.

<u>Informing choice</u>

18. There is a need to provide teachers and school leaders with easy access to authoritative, up to date information on EdTech products, enable them to be active participants in generating evidence and sharing information about what works, and equip them with knowledge and skills required to choose effective tools that can be used to support learners with SpLDs in classrooms.

19. Work funded by the Robert Bosch Stiftung on technology-enhanced learning shows how challenging it is to develop a comprehensive catalogue of interventions and illustrates the importance of a teaching base that is able to evaluate the efficacy of interventions within their specific learning environment[18].

> **Recommendation 2:** DfE should ensure that there is clear, evidence-based national guidance on the use of EdTech products to assist the learning of children with SpLDs. This guidance could be provided through the EEF or a new body.

20. To address the issues outlined above, there is a range of interventions that policymakers could consider including:

    a. **Regulation** - only interventions that have been rigorously tested by a trusted independent body (e.g. EEF) are permitted to be sold. DfE may wish to consider how EEF's role could be enhanced or complemented to provide assessment of educational interventions that are delivered digitally. EEF should consider adopting further principles and responsibilities in-line with the NICE model in the healthcare sector, acting as a learning equivalent.

    b. Develop a catalogue of **recommended products** – In 2019 DfE established a panel chaired by Professor Jackie Marsh, to accredit early years (0-5 years) language,

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[15] Current toolkit of evidence-based interventions recommended by EEF: https://educationendowmentfoundation.org.uk/school-themes/special-educational-needs-disabilities/
[16] Cheng, S. & Lai, C. (2019) Facilitating learning for students with special needs: a review of technology-supported special education studies. Journal of Computers and Education, https://doi.org/10.1007/s40692-019-00150-8
[17] https://en.unesco.org/news/spanish-application-using-ai-help-overcome-dyslexia-wins-2019-unesco-ict-prize
[18] https://www.bosch-stiftung.de/sites/default/files/publications/pdf/2018-08/Study_Technology-enhanced%20Personalised%20Learning.pdf

literacy and communication apps[19], a system which could be extended to other age groups.

c. Encourage industry-led **standards** to incentivise technology developers to provide evidence about efficacy – For example, a publicly available specification (PAS) can improve the quality of a whole industry, encouraging mutual support and collaboration, whilst influencing the marketplace and can accelerate innovation and help share knowledge and expertise to drive industry growth.

d. Encourage practices that allow schools to **test and compare** products. Different interventions will be better suited to different schools and student populations. When considering assistive technologies, school leaders may need to **research the options on the market and trial available products before** purchasing so teachers can test what works in the classroom environment. We welcome the actions announced in the 2019 EdTech strategy to help EdTech businesses reach teachers, lecturers and education leaders, including **piloting online services** to allow schools and colleges to **compare and trial technology products** and services and giving EdTech companies a new platform to engage with schools and colleges to understand their needs. Recommendation four (below) expands on the importance of funding innovation and improving the translational pipeline, including co-design with the teaching profession, to ensure proven efficacy of interventions on the marketplace.

e. **Enable evidence-based procurement** through **information sharing** among practitioners - More work should be done to encourage and enable schools to share evidence-based **user feedback** on interventions with other school leaders and teachers on the existing EdTech marketplaces (LendEd[20] and EdTech Impact[21]). DfE should also work with the teaching profession and Ofsted to develop **clearer guidance** and support and provide the teacher base with the **skills** to evaluate and select appropriate interventions.

Issue: Teachers require a better understanding of SpLDs to enable them to identify learners needing support and select the most appropriate classroom-based interventions.

21. Teachers are central to ensuring learners with SpLDs are identified and receive appropriate support. As EEF's Closing the Attainment Gap report[22] highlights, there is a strong appetite from educators to engage with and use evidence. However, initial teacher training is limited in the amount of content that it can cover, with insufficient scope to provide teachers with the necessary understanding on how to identify and support students with SpLDs[23]. Additional methods must be considered to address the gap in teacher knowledge.

22. Ofsted can significantly influence how schools approach support for learners with schools focusing on what they feel is viewed as good practice by Ofsted. Ofsted should encourage

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[19] https://www.gov.uk/government/news/early-years-apps-approved-to-help-families-kick-start-learning-at-home
[20] https://www.lended.org.uk/
[21] https://www.edtechimpact.com/
[22] https://educationendowmentfoundation.org.uk/evidence-summaries/attainment-gap/
[23] Initial teacher training typically includes little child psychology, so teachers are usually unaware of developmental milestones and the cognitive basis of SpLDs. Training does not cover neuroscience in education, so teachers are unlikely to have the knowledge to evaluate the brain-based claims of commercial products. There is a lack of any Govt-funded nor Govt-led training programmes for teachers of learners with SpLDs.

CPD for teachers and evidence-based approaches to school selection of technology-led support for learners with SpLDs.

> **Recommendation 3:** DfE should work with leaders of the teaching profession and universities to adapt teacher training avenues, CPD and support networks to ensure that teachers have an adequate understanding of SpLDs and the interventions available to support these learners.

23. The teaching profession has been active in forming networks of peer-support on SEN and EdTech through their professional bodies and social media. To complement this, we offer the following ideas for support to improve teaching professionals' understanding of SpLDs as a starting point for discussion:

    a. Teaching professionals should be encouraged to make use of large-scale online professional collaboration sites (MOOCS e.g. FutureLearn) for training and Continuous Professional Development (CPD) to improve understanding and share evidence-based practice to support the diversity of learners with SEN.

    b. There is space for a science and learning primer for teachers that focuses on key learning processes as they apply in the classroom. The Royal Society have produced a similar resource for law, with an ongoing series of primers for judges on specific science areas of relevance.[24]

    c. One of the mechanisms for improving teacher support for learners with SpLDs could be through enhanced teaching grants for universities to offer tailored masters for SpLD education, or through level 7 apprenticeships.

    d. As noted in the Rose review (2009), ensuring school access to specialist teachers, assessors and teaching assistants is imperative. This could be achieved by establishing regional networks of SEN specialists that collaborate with schools to provide advice where needed.

Issue: Developing a more robust translation pipeline. There is a need to connect researchers to both software developers and EdTech professionals to develop evidence-based interventions specifically targeted to the needs of learners with SpLDs.

24. Many effective interventions already exist but are not currently deployed widely enough, since researchers often fail to develop their work into interventions that can compete with better funded options on the marketplace. This is in part due to a lack of collaboration between leading education researchers, designers, engineers, and technology practitioners for the co-design for interventions. Research funders should raise the benchmark for the quality of the software they require for translational research, with help in identifying appropriate providers.

25. Public sector funding for development of technology-led interventions should focus on addressing relevant cognitive skills for learners most affected by SpLDs, to help address market failure. Additionally, evidence suggests these tools will be of wider value to all early learners. It is also important to consider how social benefits can be used to incentivise external investment in EdTech interventions alongside the financial return of products.

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[24] https://royalsociety.org/news/2017/11/royal-society-launches-courtroom-science-primers/

26. There is a serious disparity in the number, size, and scale of studies and level of research funding for different SpLDs, with dyslexia being the most studied. More longitudinal studies are required, as the needs of learners with SpLDs can change over time as can key risk factors (e.g. phonological weakness, socio-economic status) that increase the probability of a student having specific needs. This links with the ambitions of the DfE led SEN futures programme, which seeks to inform the design and feasibility of a potential longitudinal study of children and young people with SEN[25].

27. A wider range of research methodologies should be promoted to include iterative design-based research, cross-professional practitioner-researcher co-design methods, and case-study research methods that are more appropriate for learner-oriented interventions for complex special needs.

28. Institutions such as EEF, Nuffield and Wellcome provide some important support for developing research findings into new evidence-based interventions for students with SpLDs. However, the scale of activity focussed on application in a classroom setting is relatively minor, hard to identify and does not appear to be well coordinated. We suggest DfE should do more to shape the research and innovation system to encourage the development of evidence-based interventions to improve educational outcomes for all.

Recommendation 4: DfE should work with UKRI, Nesta and EEF to develop a new Education Technology Challenge (ETC) programme to focus research and innovation activity on delivering effective evidence-based interventions to support all learners with SpLDs.

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29. This programme will need to address gaps in the research and innovation system to:

    a. Support researchers to connect with the engineering, technology and practitioner expertise from the education sector to help translate new scientific understanding into practical applications, including proof of concept and building working prototypes that can be used with groups of learners.

    b. Connect technology developers (software experts and developers) to relevant research domains, including educators, to create high-quality technology-led interventions for SpLDs.

    c. Provide innovators with opportunities to develop, test and refine potential interventions in a real-world setting (such as classroom or at home).

Issue: Coordination of Research and Innovation. There is a need for better national coordination of research on SpLDs and developing and deploying new evidence-based interventions.

30. The Royal Society and British Academy's report on 'Harnessing Educational Research' (2018) provides an excellent summary of current challenges in translating educational research into policy and practice, with the need for improved coordination a central recommendation[26]. The GO-Science evidence reviews on SpLDs and conversations with

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[25]https://councilfordisabledchildren.org.uk/sites/default/files/field/attachemnt/SEN%20Futures%20Discovery%20Phase%20Information%20Sheet%20February%202019.pdf

[26] https://royalsociety.org/topics-policy/projects/royal-society-british-academy-educational-research/

researchers and organisations working in the education sector underscore the importance of better coordination and translation of research on SpLDs[27].

31. Collaboration is important in the co-design of new assistive interventions for learners with SpLDs that can be implemented effectively[28]. Improving networking between researchers, technology providers and research schools, can help overcome barriers to innovation, highlight R&D needs and incentivise high standards of product development. Work conducted by the Wellcome Trust and EEF has highlighted the value of including teachers in the co-design of interventions to support learners[29].

32. The UCL EDUCATE programme is a good model of collaboration between academics, the UK education technology sectors, and education sectors. Both Innovate UK and Nesta have a strong track record of encouraging academic/industry collaboration to solve a specific challenge.

33. The existing EdTech Demonstrator Programme and Research Schools Networks are good models to build on. However, more focus is needed on engaging schools, learners and parents or carers in the co-design of technology-led interventions for students. Greater connectivity between schools, learners and parents can help to improve intervention support in homes, increase parental understanding of available support channels, and inform R&D priorities.

Recommendation 5: DfE and UKRI, working with practitioners, EEF and other organisations, should consider steps needed to ensure research is coordinated to better meet current and future needs relating to SpLDs. This could form part of the remit of the Office for Education Research recommended by the Royal Society and British Academy.

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34. We suggest DfE lead work to improve the coordination of research activity and support innovation to meet the needs of schools, learners, and parents. This role would sit within the broader remit of the Office for Educational Research (OER) proposed by the Royal Society and British Academy. This kind of research coordinating body has proved effective within the health domain with the Office for Strategic Coordination of Health Research (OSCHR)[30]. Administration of funding will not form part of this new body's responsibilities.

35. Better coordination will help to identify gaps in funding for the different SpLDs, considering their proportional prevalence in the UK population and the potential impact of research, development, and translation. Dyslexia has twice the prevalence of dyscalculia in the UK, yet UKRI invested £107m in dyslexia research between 2005-2019 and only £23m in dyscalculia research.

36. Improved coordination would also help identify opportunities for collaboration between researchers, EdTech developers and teaching professionals. The OER could play an important role in recognising the value of the approach and promoting interdisciplinary encounters and the development of individuals who can play a 'bridging role' across academia, EdTech development and teaching.

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[27] https://www.gov.uk/government/publications/specific-learning-difficulties-current-understanding-support-systems-and-technology-led-interventions
[28] https://wellcome.ac.uk/news/using-neuroscience-design-education-interventions-what-have-we-learned
[29] https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/spaced-learning/
[30] https://www.nihr.ac.uk/about-us/our-contribution-to-research/

Issue: Significantly more data is needed to evaluate risk factors for SpLDs and determine which interventions work best in a classroom environment.

37. Specific Learning Difficulties are now understood to occur because of multiple risk factors (e.g. genetics, socio-economic disadvantage). Funding additional research studies that investigate these risk factors could help to improve future approaches to screening for SpLDs and learner diagnosis.

38. The National Pupil Database (NPD) contains useful information on the early years foundation stage profile and phonics screening, but it is aimed at monitoring mainstream learners. Additional data collection is needed to support learners with SpLDs. A more data-rich NPD, or linking NPD data with other sources of data, would provide new insights into the success of different types of interventions, and child development and learning outcomes. It is important to prioritise safeguards and privacy surrounding this sensitive new data, which would be designed to improve research and offer insights to inform future policy, rather than operational use. Further benefits would be seen in improved intervention design and selection of interventions by teaching practitioners.

39. To help identify learner needs and provide them with the necessary support, **further cognitive tests** are needed at regular, specified timepoints for learners who are flagged as low performing following the Early Years Foundation Stage profiling (ages 5+) or have been identified as having a SpLD. It is crucial that measurements are recorded consistently across schools to enable reliable comparison.

40. As the NPD contains pupil level data, privacy and data protection considerations mean access to data is subject to strict controls.

Recommendation 6: DfE should work with the research and practitioner communities to identify where further information or data is needed to improve identification of groups of learners who would benefit from special support, whilst encouraging consistent data collection and improving access to data.

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41. DfE should commission a suitable expert committee to develop additional metrics to identify learners with SpLDs. This could include quantitative measures of language skills, short term and working memory, enhanced tests of visual and auditory processing and other indicators of dyscalculia, dyslexia, and dyspraxia.

42. DfE should consult external stakeholders including academics, EdTech developers and education bodies (e.g. EEF) to understand obstacles in accessing NPD data and consider methods to make this data more easily available whilst protecting the anonymity of learners.

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Annex A – Map of learner centred journey

Informal, school-based assessments of needs

- Teachers and parents hold important roles in identifying the learner as requiring additional support.
- Assessment done by SENCos
- SENCos may use tools such as WESFORD to assess areas of need.
- Screener/checklist results are used to inform areas for intervention and outcomes for young people.

SEN support

- Schools hold responsibility for selecting appropriate interventions.
- Schools should consult with parent to agree action plan and provide support
- Every state school gets a notional budget to support children with SEN, school's discretion as to how they spend it.
- *If progress does not seem to be made, parents/carers may request a fuller assessment.*

Formal diagnosis

- Conducted by specialist professionals including educational psychologists and specialist SpLD assessors.
- Referral from school through local authority or commissioned by parent from independent assessor
- GP check to rule out vision/hearing problems
- Formal diagnosis is not required to receive either SEN Support or an EHCP. However, professional reports can form part of the evidence base to inform evaluation of students' need by the local authority.

Learner with undiagnosed SpLD

Evaluation of learner's needs

Learner enters higher education/ employment

Education, Health and Care Plan (EHCP)

- Legally binding, used to support students for whom SEN Support is not sufficient (3.6% of students with an SpLD in England have an EHCP)
- Criteria and implementation overseen by Local Authorities.
- Should detail any Access Arrangements that the school will apply for, to ensure exam support
- *Annual review of EHCP to tailor support (every 3-6 months for learners under the age of 5)*

- EHCP support ends when a learner ceases compulsory education after 18, enters higher education, reaches 25, leaves prison or enters employment.
- It may also be stopped if parties feel that all identified long-term outcomes have been reached and/or that the high level of support identified within the plan is no longer needed.
- Formal diagnosis becomes important for support under the Equality Act (2010)