

Mitigating the impact of poverty in STEM education:

Mini guide for schools

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Help to ensure that excellent opportunities to develop scientific literacy and STEM skills and knowledge are available to every learner as a Welsh and global citizen

Tackling the Impact of Poverty on Education



Ariennir gan
Lywodraeth Cymru
Funded by
Welsh Government



Mitigating the Impact of Poverty in STEM Education

About this mini guide

This guide specifically looks at barriers and impacts to learner engagement, involvement and aspirations related to STEM education. STEM education teaches more than just science and mathematical concepts. It also encapsulates a toolkit of invaluable skills that can be applied to everyday life and across a variety of future careers and industries. The development of scientifically literate citizens is a key driver of Curriculum for Wales – not only through the AoLE for Science and Technology – but is integral to the four purposes of the curriculum.

This guide supports the **5 Key Areas of the [Price of Pupil Poverty Guides](#)**, which identify practical steps your school can take to tackle the impact of poverty and improve outcomes for your learners:

- (1) Understanding Poverty; (2) School Uniform & Clothing; (3) Food & Hunger; (4) Participation in the Life of the School; (5) Home-School Relationship**

What does a ‘scientifically literate’ citizen look like?

The [OECD](#) previously defined scientific literacy as:

the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen

The [PISA 2025 Science Framework \(oecd.org\)](#) broadens this concept to draw on a bank of science **competencies** – (1) Explaining phenomena scientifically to demonstrate how the world works (2) Constructing and evaluating scientific enquiry, interpreting scientific data and evidence critically (3) Researching, evaluating and using scientific information for decision making and action – **knowledge** (including content, procedural and epistemic), and **science identity** (valuing scientific perspectives and approaches to enquiry, affective elements of scientific identity and environmental awareness, concern and agency).

The [PISA 2025 Science Framework \(oecd.org\)](#) also defines a set of environmental science competencies which are influenced by knowledge and science identity.

The Challenge

Poverty affects 28% of children and young people in Wales, on average. The long-term impact of the COVID-19 pandemic coupled with a number of other national and international factors is likely to have exacerbated poverty levels further.

There is substantial [research](#) evidencing the link between socio-economic status (SES) and educational outcomes with children from poorer backgrounds achieving lower grades and fewer educational qualifications than children from more privileged backgrounds. This attainment gap is persistent with 2023 GCSE results revealing considerable [inequalities](#) in the attainment gap between the most and least disadvantaged learners in the UK. The [link](#) extends to attainment and participation in science learning throughout school. Learners who come from higher SES families are more likely to do well in science subjects and continue to study science post-16, with attainment gaps persisting at this level also.

STEM skills and knowledge are in increasing demand from employers including supporting decarbonisation and the [green economy](#). Concerns regarding acute [shortfalls](#) are well documented.

[Higher education](#) is a key driver of social mobility in the UK. Young people from less well-off backgrounds who attend university are more likely to become socially mobile into higher income brackets, and income gaps are lower between graduates from disadvantaged backgrounds and their peers compared to non-graduates. However, subjects aligned to STEM show considerable variation in accessibility for students from disadvantaged backgrounds.

Mitigating the impact of poverty on STEM education is imperative. It is a matter of social justice that excellent opportunities to develop scientific literacy and STEM skills and knowledge are available to everyone as a Welsh and global citizen.

Developing and Building Science Capital

What do we mean by Science Capital?

The concept was first developed through the longitudinal Aspires research project to investigate young peoples' attitudes, aspirations and experiences to science and the barriers that exist to their inclusion, including around self-identity and the personal relevance of science in their lives and future career ambitions. The concept is drawn from the idea of 'capital' (referring to economic, cultural and social resources) with a working definition as follows:

the science-related knowledge, attitudes, experiences and resources that a person acquires through life. It includes what you know and how you think about science, who you know and the kind of engagement you have with science in your everyday life.



Research evidence shows that the more science capital a young person has, the more likely they are to view themselves as having a 'science identity', view science as personally relevant to their everyday lives as a citizen, and aspire to continue with science post-16. A subsequent study found a high correlation of Science Capital and STEM attitudes and values. The development of science capital is an important factor in helping support learner aspirations and future STEM careers. You can find more information about this study at: [2021 | UCL ASPIRES research: project blog](#).

However, building Science Capital is not just about encouraging more young people into STEM-related future careers. It is fundamentally a tool to promote social justice to help improve people's lives and life chances and help more and more diverse young people engage with STEM. Young people from under-represented groups including low socio-economic status are likely to have fewer role models visible in STEM careers than their more advantaged peers. Their families may have little to no experience with university or STEM careers, not be familiar with routes and pathways into higher education, worry about financial obligations, or not see FE, HE or STEM-related careers as viable options for their children. The Science Capital Teaching Approach enables more equitable and inclusive practices and opportunities through simple 'tweaks' to current practices in schools to break down these barriers.

In fulfilling the purposes of Curriculum for Wales for all learners by developing scientifically literate global citizens, building Science Capital is a critical piece of the holistic jigsaw.

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Developing and Building Science Capital

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A person's Science Capital can be described in 8 dimensions:

1. Scientific literacy (SC1)	<i>a student's knowledge and understanding about science and how science works. This also includes their confidence in feeling that they know about science</i>
2. Science-related attitudes, values and dispositions (SC2)	<i>the extent to which a student sees science as relevant to their everyday life</i>
3. Knowledge about the transferability of science (SC3)	<i>understanding the utility and broad application of scientific skills, knowledge and qualifications</i>
4. Science media consumption (SC4)	<i>the extent to which a student engages with science-related media including television, books, magazines and internet content</i>
5. Participation in out-of-school science learning contexts (SC5)	<i>how often a student participates in informal science learning contexts, such as at science museums, science clubs and fairs</i>
6. Family science skills, knowledge and qualifications (SC6)	<i>the extent to which a student's family have science-related skills, qualifications, jobs and interests</i>
7. Knowing people in science-related roles (SC7)	<i>the people a student knows (in a meaningful way) among their wider family, friends, peers and community circles who work in science-related roles</i>
8. Talking about science in everyday life (SC8)	<i>how often a student talks about science with key people in their lives (e.g. friends, siblings, parents, neighbours, community members)</i>

By making small 'tweaks' to your practice on a classroom, departmental and/or whole-school basis, we can broaden and deepen the opportunities for each learner to expand their own Science Capital.

This can be done through focusing on: **Relevance** – e.g. via authentic contexts and real-life scenarios, showcasing potential career opportunities, explicitly reflecting on skills and knowledge link to these; **Representation** – e.g. confronting and breaking perceptions around stereotypes, actively using role models in contexts and cultivating self-belief and self-identity in STEM; and, **Relationships** – e.g. home-school, peer-peer and peer-teacher.

The Science Capital Teaching Approach

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Developed by researchers and 43 secondary teachers over four years.

Key findings for this approach are outlined below. For more information on the research

See: [Science capital teaching approach - text version](#) | [IOE - Faculty of Education and Society - UCL – University College London](#)

*Increase in students wanting to study science at A Level

*Closing the gap: Significant increases in students' science capital

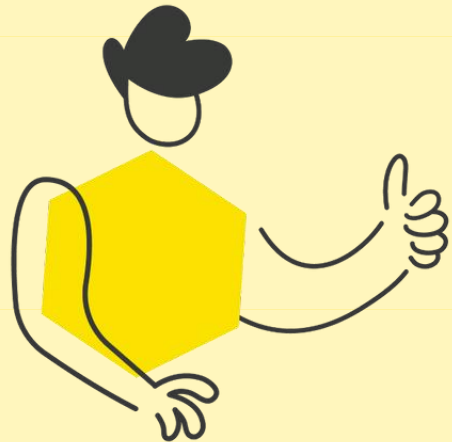
*Improved student science attitudes

*Reduction in non-participation in science outside of school

*More inclusive classroom participation

*Changing teaching practice

*Positive teacher experiences



Where can I find out more and get support to implement this?

IOP Institute of Physics
Cymru | Wales

IOP Wales has a Whole School Inclusion and Equity Network with termly TeachMeets, specific CPD on Science Capital Teaching Approach and opportunities for individual support, all for free!

For more information about membership, contact

Julia.Jenkins@IOP.org

Follow us on: 

@IOPWales

#inclusionandequity

Developing Science capital also has clear positive opportunities for developing cross curricular literacy, numeracy and digital competency as well as integral skills and all cross cutting themes which are foundations for Curriculum for Wales.

What 'tweaks' can schools make to develop Science Capital for this focus?



Here are some ideas you may like to try:

Enable all students to participate

Examine and challenge stereotypes, biases and assumptions

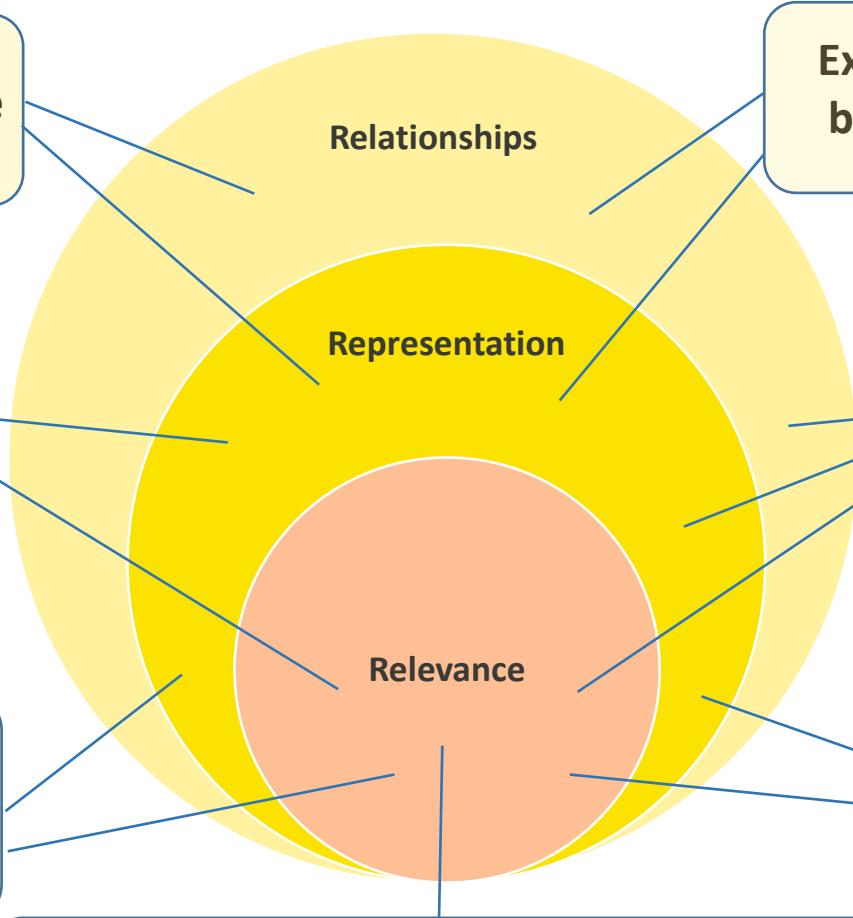
Broaden 'what counts' as STEM knowledge, skills, thinking and experience

Use 'science in the news' – local, National and global contexts to build literacy and scientific literacy

Link to careers and jobs as part of contextualising the learning and 'making it real'

Use your local contexts and knowledge of your community

Find out about and value learners' existing knowledge and experiences of science



Where can I find extra funding to support building Science capital?

One of the biggest barriers to implementing more equitable opportunities is funding.

Although many schools will operate a contingency fund for students in economic disadvantage, e.g. to attend extra-curricular events and out of school learning, barriers may still exist to exclude learners from taking up these opportunities. These may include transport difficulties home (including costs) after the event, spending money (including food if free school meals normally taken in school are missed). These issues of inequity of opportunity are highlighted in [Children in Wales' 7th Annual Child & Family Poverty Survey Findings Report](#) (pages 41 and 42).

GrantsOnline Home Regional Funding News Funding Categories

Grants Online / News / Wales

Wales

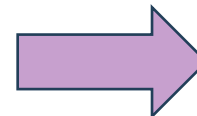
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1 2 3 4

Below and on the next page you will find some links to specific grants and directories of grant funding which could be used to support you to implement the science capital teaching approach in your school community, especially in developing equitable opportunities for learners at socioeconomic disadvantage.



[Wales - News - Grants Online](#)



Try searching for:
 Funding for STEM education
 Funding to support disadvantaged young People in STEM

Grant Funding Opportunities Specifically for STEM Education

IOP
Institute of Physics

[Public Engagement Grant Scheme | Institute of Physics \(iop.org\)](https://www.iop.org)

- ✓ Apply for up to £5,000 to run Physics-based activities
- ✓ Aligns with the [Limit Less](#) campaign
- ✓ See website for guidance on application



[Chemistry Teaching Empowerment Fund | RSC Education](https://www.rsc.org/education)

- ✓ £600 to count towards the cost of a collaborative project or event –
- ✓ In Wales, additional funding is available – see website for details
- ✓ Idea must help improve chemistry teaching in your area or help to build a strong, supportive network across local schools

Applications are particularly encouraged for projects or events that:

- support teachers or technicians at schools that are in hard-to-reach areas, either due to geography or social disadvantage.
- support teachers planning for a curriculum change.
- support teachers facing challenges in chemistry teaching, such as a lack of experience with practicals, teaching outside their specialism, or maintaining their wellbeing.



[Outreach and engagement grants \(rsb.org.uk\)](https://www.rsb.org.uk)

- ✓ A range of grants up to £1,000 to run outreach and engagement events
- ✓ Grants available for 'Big Biology Days' – one-day science festival
- ✓ See website for details



[Primary Science Teaching Empowerment Fund | RSC Education](https://www.rsc.org/education)

- ✓ £600 to count towards the cost of a collaborative project or event
- ✓ Idea must help improve primary science teaching in your area or help to build a strong, supportive network across local schools

Applications are particularly encouraged for projects or events that:

- support teachers at schools that are in hard-to-reach areas, either due to geography or social disadvantage.
- support teachers planning for a curriculum change.
- support teachers facing challenges in primary science teaching, such as a lack of experience with practicals, teaching outside their specialism, or maintaining their wellbeing.



[Science Grant Scheme | Edina Trust](https://www.edinatrust.org)

- ✓ The Edina Trust offers **£700 primary school science grants** and **£500 early years science grants**
- ✓ Schools can use their grants for science resources, gardening equipment, science weeks, science subscriptions, science visits (in or out of school) and improving school grounds for science
- ✓ For more information, see the website above



[Partnership Grants | Royal Society](https://www.royalsociety.org)

- ✓ The Partnership Grants scheme funds schools and colleges up to £3,000 to run investigative STEM projects in partnership with STEM professionals from academia or industry
- ✓ [Tomorrow's climate scientists](#) is an extension to the Partnership Grants scheme and funds schools specifically researching into climate change and biodiversity. The programme aims to give students not just a voice but an opportunity to take action themselves to address climate and biodiversity issues.

Examples of activities to support building Science Capital and equity

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A quick look at the 8 dimensions of Science Capital gives some good ideas for activities that can be built into everyday classroom interactions, can be planned into regular STEM learning activities or could be used as curriculum enhancement. Sometimes inclusion of opportunity for all can be a perceived barrier, especially if activities are extra-curricular, e.g. competitions. Sometimes students who are the most disadvantaged may miss out on such opportunities for various reasons. Even a lunchtime STEM club may prove problematic for a student who might have to choose between receiving their school meal or attending the club. A solution to this would be to include such activity (e.g. a STEM experience, outreach visitor, challenge or competition) as part of curriculum provision for all and build it into the normal school day and 'in house'. This promotes an 'inclusion and opportunity for all' ethos, allows for long term planning at both department and whole-school level, reducing the need for complex external cover arrangements where possible.

When planning for opportunities, remember the 3Rs of approach: **Relevance** – e.g. via authentic contexts and real-life scenarios, showcasing potential career opportunities, explicitly reflecting on skills and knowledge link to these; **Representation** – e.g. confronting and breaking perceptions around stereotypes, actively using role models in contexts and cultivating self belief and self identity in STEM; **Relationships** – e.g. home-school, peer-peer and peer-teacher and showcasing, exploiting and developing their personal science capital knowledge, skills and life experiences. Check out some of these examples to enhance your curriculum provision below and on the next page.

[Neon - Brilliant inspiration for STEM teachers \(neonfutures.org.uk\)](https://neonfutures.org.uk)

- ✓ *In person – in school and virtual experiences of real life STEM to enhance curriculum provision*
- ✓ *Links to careers*
- ✓ *Rich opportunities for integral skills Building – problem solving, critical thinking, Organisational skills*
- ✓ *Extensive bank of authentic careers resources and case studies to contextualise learning*
- ✓ *Extensive bank of support materials for friends and family in terms of STEM, career aspirations, funding and bursaries for further study especially if Parents and carers are unfamiliar with HE/FE*
- ✓ *Extensive bank of support materials for schools to promote STEM across school and local community*

[See Science - How can STEM Ambassadors help teachers? \(see-science.co.uk\)](https://see-science.co.uk)



STEM Ambassadors demonstrate the possibilities of STEM subjects and careers by revealing how essential STEM is throughout the world in which we live. This service is FREE to schools, colleges and community groups.

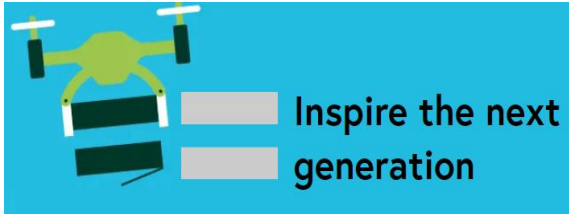
The varied skills and experiences of STEM Ambassadors enable teachers to incorporate exemplary links to the world of work into their teaching.

- ✓ *Builds relevance, representation and relationships – learners can meet people 'like them' to help them see what is possible*

Examples of activities to support building Science capital and equity

Institute of Engineering and Technology

STEM challenges – Primary and secondary, that can be used in school, at home and family learning and engagement



- ✓ Extensive resource banks of practical challenges that can be used to develop and extend integral skills through AoLE Statements of What Matter
- ✓ Offers considerable flexibility to be used in class, whole school, at home, with family and friends to support engagement and outreach
- ✓ Excellent vehicles for promoting inclusion and the '3Rs' of science capital



Home - Physics Mentoring

- ✓ Places trained undergraduate and postgraduate students into secondary schools across Wales to mentor and inspire future physicists
- ✓ Underpinned by the Science Capital Teaching Approach
- ✓ Aims to highlight the importance of transferable skills and promote STEM careers
- ✓ Aims to break down barriers and challenges to participation in Physics and STEM
- ✓ For more details including impact, see website above

Do Try This at Home



<https://www.iop.org/explore-physics/at-home>

Practical Action



Practical ACTION

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<https://www.skillsbuilder.org>



- ✓ A framework for teaching, learning and measuring essential skills
- ✓ Making transferable skills visible for learners to apply in STEM contexts, knowledge and skills
- ✓ Homezone section with activities for use with parents and carers and family and friends at home

Essential skills unlock learning in the classroom, boosting academic outcomes, perseverance and self-belief. They halve the likelihood of being out of work and increase earnings across a lifetime. They even boost wellbeing and life satisfaction. But access to these skills isn't fair. And where they are missed, it undermines social mobility, productivity and wellbeing. Everyone, at every stage of their lives, should have the opportunities to build them.

Mitigating the Impact of Poverty in STEM Education

Children living in poverty face many daily challenges. Help to ensure that excellent opportunities to develop scientific literacy and STEM skills and knowledge are available to everyone at your school.



The main Price of Pupil Poverty guide raises awareness of pupil poverty and the impact this has on children within the school setting and provides tangible, cost effective solutions that schools can take to improve the school experience, learning and wellbeing of pupils from lower income families. To view the main guide and resources, visit: [Hwb](#) or [Children in Wales](#)

Useful Links

[IOP Wales | Institute of Physics](#)

[Tackling the Impact of Poverty on Education – Children in Wales](#)

[Hwb: The Price of Pupil Poverty Guides](#)

[CiW Child Family Poverty Report 2023 English.pdf \(childreninwales.org.uk\)](#)

[Free School Meals](#)

[School Essentials Grant](#)

[Discretionary Assistance Fund \(DAF\)](#)

[OECD](#)

<https://www.grantsonline.org.uk/region-news/wales/>