



Limit Less

Teaching without limits

**An early years and primary
school perspective**

IOP Institute of Physics

**Early years and
primary schools in the
UK and Ireland**

Information about the surveys referred to in this document

In 2020, the IOP commissioned Censuswide, an international market research consultancy, to conduct two surveys and a series of focus groups to inform our campaign. The survey was of 3,007 parents and carers of children aged 5–16 in state schools in the UK and Ireland. In 2021, we commissioned Censuswide to conduct a further survey of 2,000 primary and secondary school teachers across the UK and Ireland.

Information about the quotations used in this report

In the preparation of this report, the IOP asked its members to provide their own stories of lived experience related to the stereotypes and barriers that our campaign aims to dismantle. A similar request was made to subscribers to IOP's Qubit newsletter, who are aged 16–19. A series of requests was also posted on IOP's Twitter account, [@physicsnews](#). The IOP is grateful to everyone who has shared their experiences with us and invites anyone reading this report who would like to share their own experiences to please contact us at campaigns@iop.org.

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What is Limit Less? And what are we asking you to do?

To ensure that all young people have the same opportunities, there needs to be a transformation in our education systems.

The Institute of Physics (IOP) knows that many young people are put off studying physics after the age of 16, not because of a lack of ability or interest in the subject, but because of prevailing social attitudes that discourage them. There is a widespread misconception that physics is a subject for other people, perhaps people who they think are cleverer, or who come from more privileged backgrounds or particular social and ethnic groups. This leads to many young people deciding that 'physics is not for them'. This view is picked up from all around – be it the education system, from parents and family, and from among local communities and wider society.

This must change. Limit Less is the campaign that aims to encourage and support young people to change the world and fulfil their potential by doing physics. It seeks to challenge the misconceptions and stereotypes about the subject and remove the barriers to young people doing physics beyond the age of 16.

And we need the help of teachers and senior leaders in our schools and colleges to call for this change in our system.

Schools and teachers are important influencers of young people and their parents, and we know that your work is crucial to encourage more young people from underrepresented groups to study physics in school and consider a career using physics. We need your voice to help us challenge the government to make this Limit Less dream a reality.

We are asking that you sign up to support the IOP's manifesto for change which you can read in this report. It outlines how schools, nurseries and early education providers can be more inclusive across the UK and Ireland. There are ten areas of improvement that can help make physics learning, and all education settings, more inclusive.

We look forward to working together to build a fairer and more inclusive environment in schools for all young people through the Limit Less campaign.



Which young people are we talking about?

The IOP has identified five groups that are currently underrepresented or underserved in the physics community – young people in these groups are less likely to do physics and more likely to face a [hostile environment](#) when they do. These groups are:

- Girls
- Young people from disadvantaged backgrounds
- Disabled young people
- LGBT+ young people
- Young people of Black Caribbean descent

This report explores the issues in encouraging young people from these groups to continue with the subject, as well as discussing some of the solutions. It also provides an overview of the available data relating to participation and attainment in physics beyond the age of 16, as well as the significant data gaps for certain groups.



“It was at primary school, when I was about seven, that I was first told I wasn’t good at maths. My dyspraxia (a motor coordination disorder) meant I had bad handwriting and my dyslexia meant I sometimes reversed my numbers when copying problems off the board, so my answers would be wrong. On top of that, I was an August child, so my co-ordination was always going to be delayed. I was put in the bottom group for maths and my parents were told I was not keeping up with my classmates and that I was not an academic child. That really bothered me, because I loved maths. Being written off and underestimated made me determined to prove my teachers wrong.”

18-year-old female student with autism

Why is this an issue for early years and primary schools?

You might be wondering why you, as an early years practitioner or primary school teacher, should be concerned with young people taking physics?

Many interventions to tackle inequity focus on secondary schools and post-16. However, by this time, young people have been exposed to over a decade of stereotypes, biased expectations and narrowing options. By reaching young people as early as possible, we can counter the narratives that make them feel that science is not for them.

Challenging stereotypes

Stereotypes are everywhere – from our everyday conversations to newspaper headlines, birthday cards to baby milk adverts. Research by psychologists indicates that even by the age of two children have already embedded some stereotypical views.

Many children self-select out of certain activities or spaces based on their observations of what is appropriate for “people like them”. This can include avoiding activities where they are “the only one”.

I work with children of all primary ages in STEM subjects, specifically engineering and computer science. I like to start with them drawing an engineer then look at challenging the stereotypes in their drawings”.

(Primary School teacher, Scotland)

Stereotypes have also been identified in research conducted by the IOP as a key factor in children’s choices and aspirations, affecting the [subjects they choose to study in school](#). By the time, young people are choosing their post-16 qualifications, differences in choice are stark.

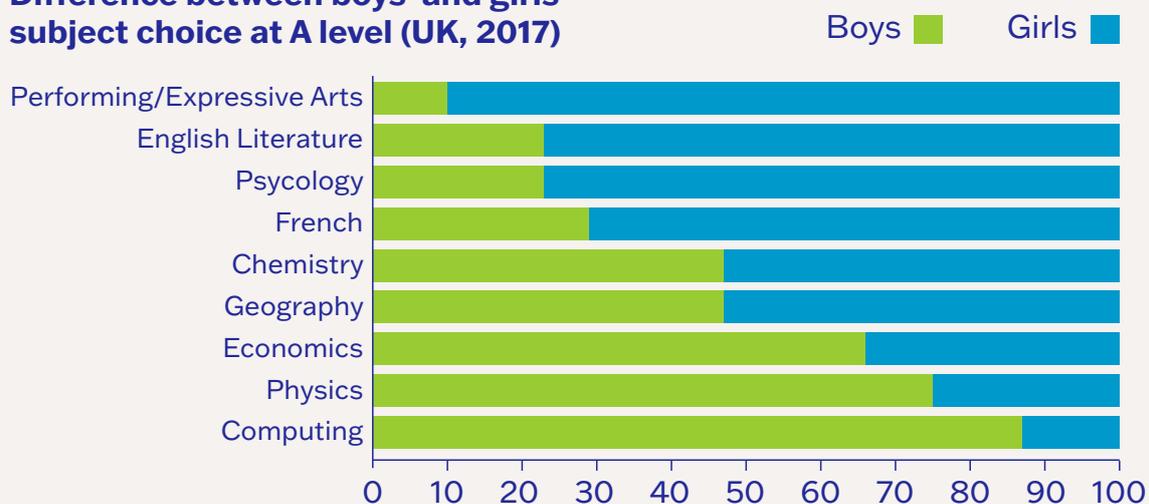
Such stereotypes are not just a problem in the classroom; they are internalised and carried through to later life.

They affect [career aspirations](#) and choices – [studies from Education and Employers](#) show that children’s ambitions are shaped by gender stereotyping from the age of seven.

It’s not just in terms of academic opportunity and success that stereotypes have a negative impact. The [Children’s Society](#) has shown that children who are strongly influenced by stereotypes can suffer lower well-being. Furthermore, those who do not conform to the stereotypes can experience bullying and harassment.

Stereotypes may be impossible to avoid, but their impact can be countered.

Difference between boys’ and girls’ subject choice at A level (UK, 2017)



Post-16 study of physics by gender:

	Female students	Male students	Year	Source
Republic of Ireland	1869	5884	2019	State Examinations Commission
England	7147	24685	2020	Joint Council for Qualifications
Scotland	2290	6027	2019	Scottish Qualifications Authority
Wales	237	738	2019	StatsWales
Northern Ireland	290	750	2020	Joint Council for Qualifications

Although subject and career choices may seem far off from your settings, early years and primary school lay the foundation of young people's expectations and aspirations. By challenging stereotypes early on, and encouraging young people to do the same, we can empower young people to truly fulfil their potential.

A [government longitudinal study](#) in England showed that the eventual difference in KS4 performance between Black Caribbean and White students is not from lack of progress in secondary school, but may stem from attainment differences prior to secondary school.

We want young people to have every option when considering their futures, and we want physics to be one of those options.

As early years practitioners and primary school teachers, you have the opportunity to nurture and develop young people who won't have a limited view of themselves based on the stereotypes of groups with which they share characteristics.

This isn't just about telling young people "You can do physics", this is about providing them with the tools – confidence, risk-taking and a sense of adventure – so they will take on opportunities throughout their lives, even if actively discouraged by others.

Research from the [ASPIRES project](#) has shown that even when young people enjoy science, they can often feel that science is “not for them”. We can combat this by showing a wide range of role models working in a range of careers that use science, and include people who the young people can relate to (that share characteristics, are for the local area, etc.)

In order to make systemic and sustainable change, we are calling on the governments in the UK and Ireland, to embed inclusivity in our education systems, making it easier for early year practitioners and teachers to remove barriers and provide opportunities for all young people.

Case study on belonging

An early learning and childcare centre, aware that their block play area tended to be dominated by one group of boys, carried out a short piece of action research. They experimented with putting pink into the area, using anything they had to hand such as feathers, beads, and ribbons.

They found that the boys were “horrified”. Meanwhile, some girls began to interact with the area in new ways.

It was never intended as a long-term solution but highlighted to the staff that the way an area is set up can have a significant impact on who interacts with it.

You can read more here: [Improving Gender Balance – Case studies \(education.gov.scot\)](#)



63.1%
of primary school teachers in the UK and Ireland agreed that societal issues, such as equity and inclusion, have a place in subject specific teaching.

Censuswide survey of 2000 primary and secondary school teachers across the UK and Ireland

Our manifesto for change

The IOP is calling on the governments of the UK and Ireland to:

1. Revise professional standards for teachers to set out an expectation that teachers will address injustice in their professional practice and actively dismantle any sexism, racism, homophobia, ableism and classism from their own work and their schools.
2. Ensure that all teachers are trained to teach inclusively and to tackle injustice so that they can achieve these robust standards. This should be in both their initial teacher education and their continuing professional learning and development.
3. Direct those responsible for school inspections to place greater emphasis on the importance of inclusive teaching and schools' efforts to address injustice.
4. Mandate nurseries, early education providers and schools to develop whole-school equity action plans that:
 - are informed by ongoing data and evidence collection including students' choices.
 - promote equity and equality for young people in underserved groups.

In all nurseries, early education providers and schools the IOP wants to see:

5. All staff challenge bias and stereotyping.
6. Educators, parents and students develop and implement whole-school equity action plans that provide an inclusive environment and promote equity and equality for young people in underserved groups.
7. Those responsible for school governance play an active role in ensuring that equity and equality are promoted in their schools and that inequalities are addressed, including appointing a member with specific responsibility for equality.
8. Teachers teach physics and science in an inclusive way that promotes a positive, contemporary view of physics and portrays physicists from a wide range of backgrounds including the underrepresented and underserved groups.
9. All young people and their parents and carers receive a high standard of careers advice that includes physics-related career options and promotes studying physics beyond age 16.
10. More young people from underserved groups benefit from learning outside the classroom, such as in science or STEM clubs.



A whole school approach to equity

Research by the IOP has indicated that school culture is a substantial factor in determining subject choice. One study, "[Closing Doors](#)", showed that 81% of state-funded, mixed schools in England were either maintaining or exacerbating the already poor gender imbalance of progression into English, mathematics, biology, physics, economics and psychology. The study also showed that to reduce the gender imbalance in one subject, the schools needed to look to reduce the imbalance in other subjects, further showing the importance of school culture. The conclusion of the data analysis was that gender imbalances arose from school culture, biases, and gendered expectations of students.

A subsequent study, "[Opening Doors](#)", looked at good practice in schools for countering such stereotyping. This research emphasised that to truly challenge biases and stereotyping, work must go beyond the physics classroom. For systemic and sustainable change, commitment is needed from students, teachers of physics and of other subjects, senior leaders, governors, trustees, parents and carers. When such approaches have been used, the impact has been significant. For example, the number of girls taking AS-level physics more than trebled in over two years following a whole-school challenge to address imbalances.



“A whole school equity plan is ensuring that the school (our community – so that’s the parents, the students, and the teachers) are all involved in coming up with a common vision: that every child in the community is entitled to that inclusivity and diversity of the curriculum that allows them to see beyond, not only what they have right now in front of them in terms of their own community but the wider picture, and they can then build upon when they go into society.”

Jamie Drake, Curriculum Director of Science and Social Science, Noel Baker Academy, Derby

Learn more at: iop.org/WholeSchool

More than two thirds of primary school teachers who have whole school equity plans reported seeing positive change as a result of the plans being implemented.

Censuswide survey of 2000 primary and secondary school teachers across the UK and Ireland



A whole-school approach truly involves the whole school – areas to consider are shown below:

<p>Personal practice: supporting staff to reflect</p>	<p>All teaching and non-teaching staff within the school should be included in such work, trained to play an active role and made aware of the effect of biases, conscious and unconscious.</p>
<p>Student voice: putting young people at the heart of change</p>	<p>A crucial step is supporting children and young people in understanding and challenging injustice and stereotypes and allowing them ownership of the issues.</p>
<p>Curriculum and learning</p>	<p>Resources and the curriculum should be audited to ensure equal opportunities. Learners should be able to choose subjects and activities based on their preferences and skills, rather than being guided by their gender, race, sexual orientation, disability or background</p>
<p>Progression, choices and jobs</p>	<p>Everyone has a role to play in opening learners' eyes to the diversity and range of options available for their future, which should not be limited by their own or others' expectations</p>
<p>Internal and external communications</p>	<p>Schools communicate with a wider variety of audience including parents, carers, students, staff and the wider community. Processes should be put in place to make sure communication and materials counter stereotypes and do not reinforce bias.</p>
<p>Engagement with parents, carers and the wider school community</p>	<p>The biggest impact will be made when the whole school community works together. Involving parents and carers from the start can help children and young people challenge inequality in wider life.</p>

What you can do

To build a fairer and more inclusive environment in schools for young people from underrepresented and underserved groups we need your support. Today you can take the following actions:

1. Sign up to the manifesto

Please sign up to the manifesto today so that we can show our politicians that we have widespread support for improving equity and inclusion across the education sector. To sign up on behalf of your school or as an individual teacher, or both, please visit <https://campaign.iop.org/manifesto>.

With your help we will call on our governments to provide more support for teachers to create inclusive school environments. We will take our message to parliamentarians and assembly members, government groups and officials, to get their support in both parliament and in the media and push for concrete changes.

2. Learn more about the Limit Less campaign and share!

Visit the main Limit Less campaign page iop.org/LimitLess to find out more about the campaign, view resources, and read stories from people who were deterred from physics because of who they are.

We have a growing number of individual supporters and would welcome even more. Please share this link with your friends and family and ask them to join as individual supporters, the more people who join our campaign, the more likely we are to change young people's future for the better.

3. Tell us about your whole school approach

If your school has already adopted a whole school approach and is building an inclusive environment for all students, we would be very interested to hear from you, both to celebrate your success and so that others can learn from your activities. Please contact us at campaigns@iop.org.



iop.org/LimitLess