The Association for Science Education (ASE): Inclusion in Science

IMPACT EVALUATION REPORT (FINAL)

JULY 2024

www.evaluation.impactedgroup.uk

Contents

Executive Summary

The Association for Science Education (ASE) is an active membership body that has been supporting all those involved in science education from pre-school to higher education for over one hundred years. The ASE's Inclusion in Science team ran the Inclusion in Science programme, which is an online CPD programme targeted at science teachers and leaders:

▶ who recognise inclusion is key to addressing gaps in engagement and attainment they see for different groups of students.

▶ who want to reflect and make changes so every student feels that science could be for them.

It was fully funded by the Department for Education (DfE) for teachers of Key Stages 3, 4 and 5 in state-funded schools in England. In the 2023-24 academic year, the programme ran two cohorts with a total of 235 participants.

The ASE's Inclusion in Science Leads and ImpactEd Evaluation began their evaluation partnership in January 2024 with a review of their existing Theory of Change. In April 2024, ImpactEd Evaluation was asked to evaluate the impact of the programme based on the data collected by the ASE's Inclusion in Science team. This report contains findings based on quantitative and qualitative data collected from cohort 1 and 2. The evaluation showed the programme had an overall positive impact on outcomes, as noted in findings below:

1 An overwhelming majority of participants felt confident about various aspects of building an inclusive culture in their classroom after the programme. For example, 96.9% felt confident about making students feel welcome.

2 95.7% of participants found the sessions to be of good or very good quality.

3 60.2% participants said that after the programme they mostly or completely review their department practice in pedagogy, curriculum, and resources to ensure it's inclusive of the school community.

4 Participants saw an increase of 48.0% in their knowledge of inclusive practice.

5 There was a 29.1% increase in participants' awareness of their own biases.

Conclusion

▶ **The Inclusion in Science programme is a high quality CPD programme.** An overwhelming majority of the participants found the programme to be of high quality and said it helped improve their subject knowledge and skills. The programme can be therefore of value for future cohorts of participants too.

▶ **Teachers gained valuable knowledge and skills to build an inclusive culture in their science lessons.** There was a large increase in teachers' knowledge and skills of inclusive practice after the programme. Specifically, appropriate use of inclusive language was successfully implemented by most participants in their teaching. This means teachers leave the programme well equipped to take their learnings back to the classroom.

▶ **Teachers are confident in building an inclusive culture in their classrooms.** After the programme, an overwhelming majority of teachers reported that they were confident in various aspects of building an inclusive culture, most notably: using inclusive language, challenging non-inclusive/ stereotypical language, making students feel welcome and engaging them in science lessons.

▶ **Teachers and science departments more widely are reflecting on their current practice.** Participants reported the programme has facilitated and given them tools for reflecting on their practice, with some examples of how they will implement it at a department-level too. The programme therefore is making progress towards the outcome of increased reflection on current practice by science departments which may lead to an impact on a larger scale.

▶ **The programme was most successful in improving teachers' knowledge about inclusive practice.** Participants saw the largest increase in their knowledge of inclusive practice after the programme. There is scope however for improving confidence in diversifying/decolonising the curriculum and strategies for embedding curriculum review at a department level.

Recommendations for programme delivery

▶ **Continue breakout groups and seminar discussions and increase time for interaction among participants where possible.** Participants really valued the breakout groups and other interactive spaces in the programme which helped them with sharing ideas, having a safe space, and talking to other teachers.

▶ **Continue providing resources such as the Padlet, Equity Compass, and resources relating to careers.** These were the most frequently rated as useful resources by the participants, and many of them shared these with their peers at school too. Some of the resources relating to careers were eye-opening for some participants and helpful for promoting careers in an inclusive way back in their classroom or school.

▶ **Consider adding more flexibility in terms of time.** Although participants appreciated the flexibility in general and being able to catch up on the sessions and materials online; some mentioned having an alternative for sessions and having more time to complete pre-reads would be helpful.

Recommendations for evaluation

▶ **Continue qualitative research through interviews and focus groups with participants.**
Qualitative research provides rich insight into the experience and impact of the programme and is useful in triangulating quantitative data. We recommend continuing this practice in future evaluations.

▶ **Consider using identifiers for surveys to match pre and post programme surveys.**
Analysis of a matched dataset would further strengthen the conclusions. We recommend using identifiers in teacher surveys so they can be matched.

▶ **Embed the data collection in the programme further to have a higher response rate.**
Embedding the evaluation and data collection into the programme by giving dedicated time for participants to complete the surveys and sharing interesting insights from the surveys with them will ensure the response rate is high.

▶ **Consider research with pupils to see if the implementation has been useful for them.**
As pupils are indirect beneficiaries of the programme, the ASE may find it useful to conduct research into the impact of similar future programmes through the lens of pupils.

1. Introduction

The Association for Science Education (ASE) is an active membership body that has been supporting all those involved in science education from pre-school to higher education for over one hundred years: teachers, technicians, teacher educators, researchers and others involved in science education. The ASE's Inclusion in Science team ran the Inclusion in Science programme, (previously Inclusion in Schools) which is an online CPD programme fully funded[1] by the Department for Education (DfE) for science teachers and leaders of KS 3/4/5 in state-funded schools in England.

The programme contained six modules that are delivered over a 6-month period via six webinars and three seminars. These sessions have many opportunities for discussion and interactive learning. All teachers are provided with a supporting workbook and resources to help implement learning in their classrooms. Include information about the leadership pathway – leaders were invited to stay on extra 30 mins at the end of seminars and had different pre course tasks in the workbook.

In the 2023-24 academic year, the programme ran in two cohorts. The first cohort (hereon referred to as cohort 1) began the programme in October 2023. There were 238 teachers who enrolled and 108 who completed the programme. The second cohort (hereon referred to as cohort 2) started in January 2024. 248 participants enrolled and 127 completed the programme. When referring to the participants of the programme hereon, we are referring to those who completed the programme. Participants across both cohorts include 58.0% teachers and 42.0% leads (Head of science, deputy head of science, curriculum lead, deputy lead, Head of individual science subjects, deputy of individual science subjects). 8.0% within the leads also had SENDCO (Special Educational Needs and Disabilities Coordinator) responsibility within science.

In January 2024, the ASE's Inclusion in Science (IIS) Leads and ImpactEd Evaluation began their evaluation partnership starting with a review of their Theory of Change. ImpactEd Evaluation facilitated a Theory of Change workshop where the IIS Leads worked on refining the outcomes from their existing Theory of Change so it reflected the outcomes for the Inclusion in Science programme. Following this, ImpactEd Evaluation designed a streamlined survey for evaluating the programme, based on the Inclusion in Science programme's existing surveys.

In April 2024, ImpactEd Evaluation was asked to evaluate the impact of effectiveness of the programme based on the data collected by the ASE's Inclusion in Science team. The reporting was planned in two parts- first, an interim report based on findings from cohort 1 data which was submitted in May 2024. Second, this final report based quantitative and qualitative data from cohort 1 and 2.

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[1] DfE funding period ran between 1st September 2023 to 31st August 2024

2. Methodology

This section contains key research questions, outcome measures, the evaluation design for data collection, and limitations of the approach.

Research Questions

The following research questions from discussions and workshops with the partner have guided the evaluation

1. What is the impact of Inclusion in Science on the following outcomes?
   - Improved understanding of the need for and benefits of inclusive culture in teaching science
   - Improved skills to embed inclusive culture in science lessons
   - Improved confidence in building an inclusive culture in science lessons
   - Increased reflection on current practice in pedagogy, curriculum, and resources
2. For which outcomes has the programme been most/ least effective?
3. How effective was the implementation of the programme?

Outcome Measures

The following outcomes along with feedback on the programme were measured in this evaluation. The table shows the tools used to measure the outcomes.

Outcome	Quantitative measures	Qualitative measures
Improved understanding of the need for and benefits of inclusive culture in teaching science	▶ Inclusion Matters questionnaire ▶ Intended learning outcomes survey ▶ Post-module survey	
Improved skills to embed inclusive culture in science lessons	▶ Inclusion Matters questionnaire ▶ Post-module survey	▶ Interviews and focus groups ▶ Case studies
Improved confidence in building an inclusive culture in science lessons	▶ Inclusion Matters questionnaire	
Increased reflection on current practice in pedagogy, curriculum, and resources	▶ Inclusion Matters questionnaire	
Feedback on programme implementation	▶ Post-module survey	

Table 1: Outcome measures

Evaluation Design

This section contains detail on the overall approach, survey design, administration, sample, and analysis.

Design and administration

We took a mixed-methods approach for this evaluation, drawing on quantitative data collected from surveys and qualitative data collected through interviews and focus groups. The table below provides detail on design and administration of the quantitative and qualitative measures used in this evaluation, as mentioned in Table 1. All questionnaires can be found in the Appendix.

Measure	Detail	Baseline	Final
Quantitative			
Inclusion Matters questionnaire	This survey was designed by ASE and streamlined by ImpactEd Evaluation. administered this survey to participants of the programme through Microsoft Forms. This comprehensive 31-question survey was designed to measure the four outcomes in this evaluation. Most questions were multiple choice with various scales for answer options. The survey also had optional qualitative questions where the participants could add comments/ explanations to their answers.	✓	✓
Intended learning outcomes survey	The intended learning outcome survey is sent out by STEM Learning, who collect the results and pass them onto ASE. A baseline survey is sent out 7 days before the course for participants to record what they want to get out of the CPD by establishing their learning outcomes. A final survey is sent out after the programme to understand how those intended outcomes were achieved and teachers' feedback on the programme.	✓	✓
Post-module survey	The ASE Evaluation lead in conjunction with colleagues designed the survey in September 2023 for the purpose of collecting feedback on each module/seminar of the programme. Course leaders shared a link to the survey at the beginning or end of each module session via the chat box to be opened as a tab and asked participants to fill in the survey while they were still in the session.	--	✓
Qualitative			
Interviews and focus groups	The IIS Evaluation lead and co-lead conducted online interviews and focus groups with participants at the end of the programme. The question guide for interviews and focus groups	--	✓

	was designed by the Evalaution Lead as well and included questions on classroom practice, programme feedback, and overall impact.		
Case study	The Evalaution Lead conducted case studies, which were in-depth, online interviews to mainly understand how teachers were able to implement learnings from the programme in their classrooms as well as in the wider department or school. The case studies were designed by ImpactEd Evaluation.	--	✓

Table 2: Outcome measures: detailed information

Sample

The breakdown of survey responses for cohort 1 and 2 are presented in Table 3. Please note that as post-module surveys are administered after every module, i.e., six times in total- the sample is the total number of responses across those six surveys.

Cohort/ subgroup	Participants	Baseline		Final		
		Inclusion Matters questionnaire	Intended Learning Outcomes survey	Inclusion Matters questionnaire	Intended Learning Outcomes survey	Post module feedback survey
Cohort 1	108	26	19	34	19	273
Teachers (including STEM teacher, engagement and enrichment lead etc.)	48	16	--	13	--	Not available
Leaders	60	10	--	21	--	Not available
Cohort 2	127	64	Participants did not engage	64	Participants did not engage	251
Teachers (including STEM teacher, engagement and enrichment lead etc.)	86	31	--	36	--	Not available
Leaders	41	33	--	28	--	Not available
Total	235	90		98	--	

Table 3: Sample size: surveys

The desired sample size was calculated to draw meaningful conclusion for a total of 235 participants was calculated as 147[2].

$$\text{Sample size} = \frac{\frac{z^2 \times p\,(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p\,(1-p)}{e^2 N}\right)}$$

[2] Calculated using the formula where N = population size • e = Margin of error (percentage in decimal form) • z = z-score. The z-score is the number of standard deviations a given proportion is away from the mean.

For interviews, focus groups, and case study, the sample breakdown is provided below in Table 4. A total of 16 participated in interviews and 8 participated in focus groups.

Subgroup	Interview	Focus group
Cohort 1		
Teachers	1	4
Leads	2	3
SEND teacher		1
Cohort 2		
Teachers	7	
Leads	4	
Other	2	
Total	16	8

Table 4: Sample size: interviews and focus groups

Analysis

Surveys

For each question in the Inclusion Matters questionnaire and Intended Learning Outcomes surveys, we have calculated the change in proportions of responses for each of the points on the Likert scale between baseline and final, for example, the increase or decrease in the percentage of teachers that selected 'Strongly Agree'. For the post module feedback survey, the proportions of responses for each of the points on the Likert scale are calculated.

Interviews, focus groups, and case studies

The qualitative data was analysed using a deductive thematic approach, meaning that we systematically 'code' the data to find common themes and present these, drawing on examples where appropriate.

The qualitative data from focus groups and interviews was triangulated with the quantitative survey data to understand the reasons behind the impact on outcomes. Where needed, we have presented where this data validates or contradicts the quantitative findings and vice versa. When presenting quotes from teachers, they are attributed anonymously for example, 'Teacher'. Case studies include names of participants and their schools as they have given their consent.

Limitations

This section provides an overview of the key limitations of the approach. There are some limitations with this evaluation that should be considered when assessing its findings. Generalisations should be made with caution, especially when the change observed is based on a small sample in the absence of a control group.

▶ **Self-reporting measures**: The evidence collected in this evaluation is based on self-reporting by participants through surveys and quantitative research. This is especially important to note as the surveys ask about their biases, and it is hard for individuals to identify their own biases.

▶ **Sample size**: The sample sizes for surveys were smaller than desired by 88 responses/data points to make robust claims about the impact of Inclusion in Science programme, hence the findings presented for these samples should be viewed in that context. This has been mitigated by qualitative research with 24 participants to ensure representation of participants in the data and findings.

▶ **Analysis using unmatched data**: As no identifiers were used in surveys, we were not able to match responses. In this report, we calculated percentage changes using an unmatched sample. Therefore, the change observed should be viewed with caution as it might not contain responses from the same set of teachers.

▶ **Bespoke/ custom surveys**: In the absence of suitable academically validated measures, the evaluation uses bespoke/ custom survey questions as detailed in Table 1. Although careful attention has been given to the language, scales, consistency, and coverage of outcomes in these surveys, their ability to accurately measure the outcomes is untested.

▶ **Not all users participated in surveys:** Not all participants who completed the programme responded to the surveys. This means the sample that responded may have something different to say compared to wider cohorts, and therefore the data is subject to selection bias.

3. Outcomes

This section includes key findings based on both qualitative and quantitative data for each of the four outcomes from the Theory of Change.

Improved understanding of the need for and benefits of inclusive culture in teaching science

There was notable increase in participants' awareness of both their own biases, and of pupils that are from under-represented backgrounds after the programme. As seen in Figure 1, survey findings show that compared to the start of the programme, the largest increase of 30.7% was in participants' understanding of the link between positive pupil outcomes and inclusion. Following that, there was an increase of 29.1% in participants saying they were mostly or completely aware of their biases. Finally, there was an increase of 12.9% in participants who said they were mostly or completely aware of which pupils are from under-represented backgrounds.
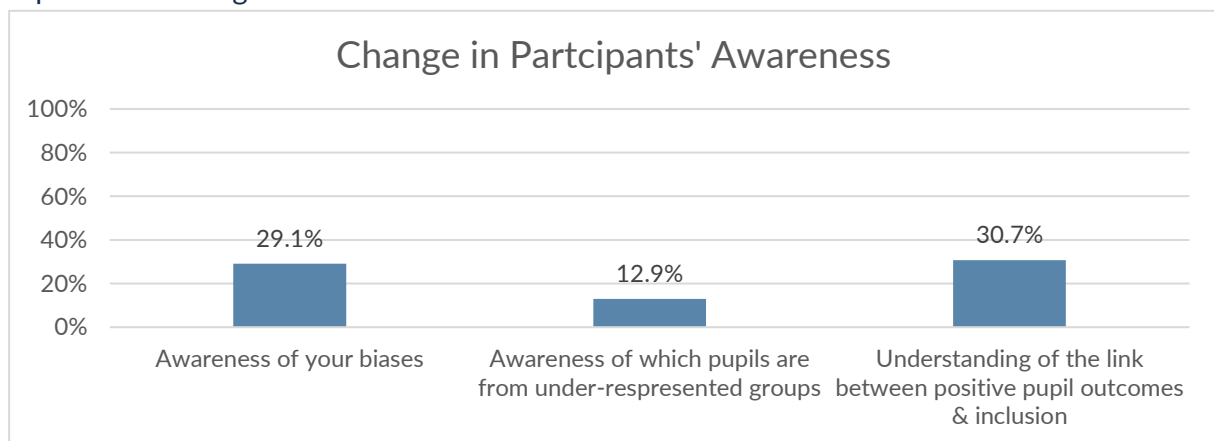

Figure 1: Change in participants' awareness (n=90 at baseline and 98 at final)

Participants also shared their views via comments on what benefits they saw of incorporating inclusive practice into science lessons, below are the key themes that emerged:

- Equal Opportunities: Ensures every student has the chance to advance in science, regardless of background.
- Increased Engagement: Inclusive practices result in higher student involvement and interest in science, leading to improved attendance and outcomes.
- Enhanced Attainment: Students show higher attainment levels, with inclusive education fostering greater confidence and willingness to participate.
- Diversity in STEM Careers: Raises the number of individuals from diverse backgrounds entering STEM fields, broadening the talent pool.
- Fighting Stereotypes: Challenges myths about affinity with science among different groups, promoting broader participation.
- Improved Behaviour: Better student behaviour follows from enhanced engagement due to feeling valued and included in the classroom.

- STEM Uptake: Drives more students to pursue science beyond compulsory education, enriching science capital.
- Diverse Perspectives: Encourages a wider range of ideas and understanding, breaking stereotypes around who scientists are.
- Inclusivity in Language: Uses inclusive language and highlights contributions from minority figures to inspire and educate.
- Personal Relevance: Makes science more applicable to individual students, fostering a sense of belonging and relevance.

> "I think it will allow them to acknowledge that there are biases around them and to get them to recognize their own biases, and maybe just be more open minded about science as a possible career for them. So, I'm hoping that, you know, as we continue, we'll start to get more students selecting science as a career for them."- Participant

Overall, participants' comments indicated that inclusive practice in science education cultivates a supportive learning environment where students of all backgrounds can achieve success, enjoy learning, and view science as a viable and desirable career path.

Through interviews and focus groups too, participants shared the positive impact that they see their practice has or will have on students. Soon after the programme, it was evident many of the participants had already made changes to make their practice more inclusive and started to see positive impact. During discussions, they shared their commitment to inclusivity in science education, putting emphasis on strategies to address both overt and subtle biases. Initiating changes such as enhancing science's relatability are part of their strategy to raise student aspirations. The educators recognise the necessity of practical measures like designing thoughtful seating plans to promote inclusion and listening to the unique needs of students who have an Education, Health, and Care Plan (EHCP) and those eligible for Pupil Premium (PP).

The participants identified the creation of a safe space for students to ask questions as a cornerstone of engagement. Openness to student curiosity is promoted as a fundamental aspect of learning, regardless of whether queries directly relate to the subject matter. The movement towards greater inclusivity in the educational landscape is thus marked by a drive to understand and connect with students' personal and learning barriers.

Ultimately, participants noted that the inclusive shift in teaching practices is poised to positively impact student learning outcomes. The encouragement of collaborative learning experiences plays a significant role in this impact, suggesting a direct correlation between inclusion practices and the academic achievement. .

Improved skills to embed inclusive culture in science lessons

Figure 2 shows changes in participants' knowledge and skills after the programme which were all positive. The highest increase was in participants' knowledge of inclusive teaching practices where 48.0% more participants said they were mostly or completely knowledgeable about inclusive teaching practices. Followed by this, there was a 19.9% increase in participants' strongly agreeing or agreeing that they feel the diversity of their classroom was reflected in their lessons after the programme. Finally, there was 14.6% increase in participants saying they were mostly or completely using inclusive language appropriately.
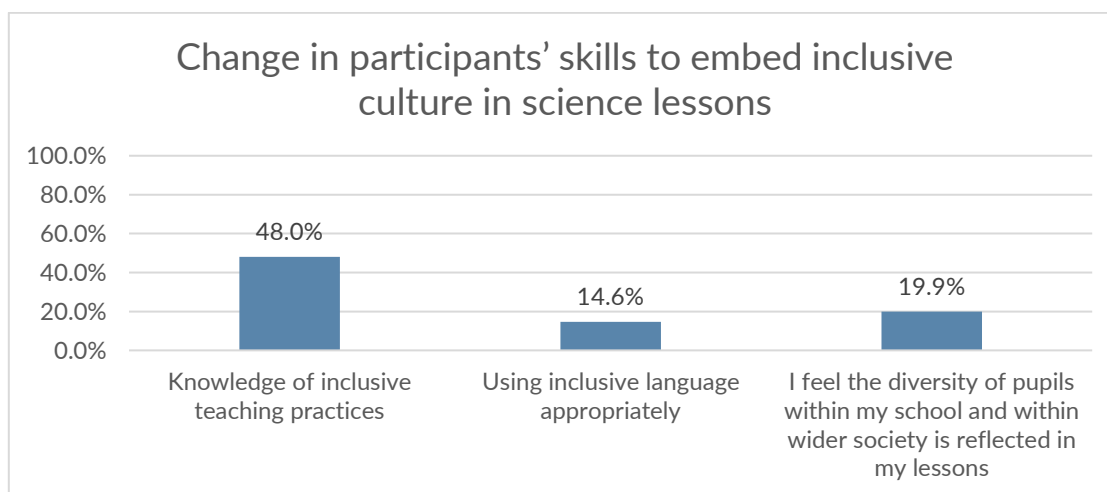

Figure 2: Change in participants' skills to embed inclusive culture in science lessons (n=90 at baseline and 98 at final)

Comments from teacher surveys after the programme show that recent initiatives have been introduced to update the science curriculum to be more inclusive and reflect diversity. This encompasses ensuring resources and planning documentation accommodate protected characteristics, embracing ethnic diversity in lesson content, and supporting students from minority groups. Despite the challenges with the current tight curriculum and its Europe-centric nature, efforts are being made to present science in a more global context and combat stereotypical representations by highlighting contributions from women, non-binary, disabled, and Global Majority scientists within lessons. This strategy is further supported by discussions around the history of medicine and incorporating multi-cultural representations and inclusive terminology. A conscious effort is also geared towards addressing the underrepresentation of various cultures and ensuring that lesson materials such as images are inclusive, as well as promoting an unbiased environment concerning sexual orientation.

Participants also discussed the changes they had or will make as a result of the programme. The sessions have led participants to reconsider their teaching language and practices to better represent diversity and reduce gender bias. Simple language modifications are crucial for student perceptions and inclusive engagement. The most common themes in the changes were to: challenge stereotypes, diversify role models, and accommodate all learner needs and initiating changes in teaching strategies to aid students with a range of prior attainment. There is also a commitment to embedding inclusivity in teaching methods and pursuing a whole-school inclusivity strategy.

Improved confidence in building an inclusive culture in science lessons

Figure 3 shows the percentage of teachers mostly or completely confident in specific areas of inclusive practice. This data at the end of the programme shows that the majority of the participants were mostly or completely confident in all areas of inclusive practice as defined by The ASE. The most confidence is seen in 'Making students feel welcome in science lessons' at 96.9% and the relatively least confidence is seen in 'Diversifying and/ or decolonising the curriculum' at 69.3%. Although the module in which this skill was covered was well received by the participants, this may be an indicator that participants need more resources or time to learn and practice diversification and/ or decolonisation of the curriculum.

Participants' confidence in building an inclusive culture in science lessons after the programme

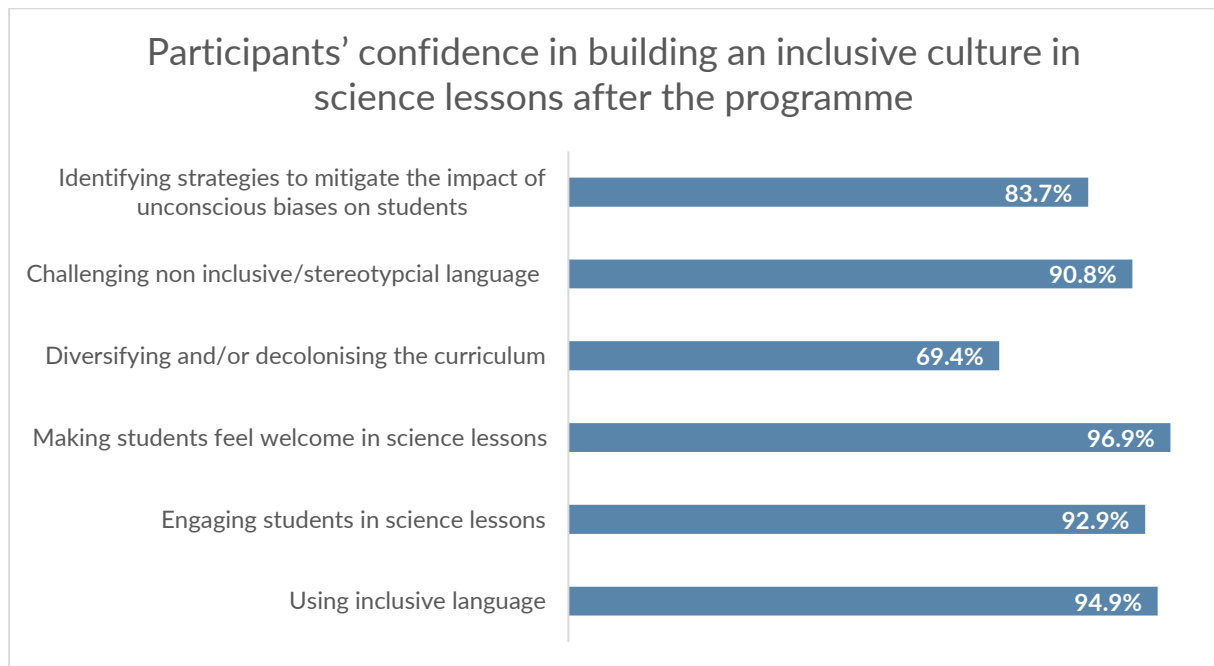|	
Identifying strategies to mitigate the impact of unconscious biases on students	83.7%
Challenging non inclusive/stereotypical language	90.8%
Diversifying and/or decolonising the curriculum	69.4%
Making students feel welcome in science lessons	96.9%
Engaging students in science lessons	92.9%
Using inclusive language	94.9%

Figure 3: Participants' confidence in building an inclusive culture in science lessons after the programme (n=98)

Increased reflection on current practice in pedagogy, curriculum, and resources

Figure 4 shows the percentage of participants reviewing departmental practice and being aware of the stereotypes in their resources after the programme. It can be seen that at 60.2%, the majority of the participants mostly or completely undertake the task of reviewing the departmental practice and resources to ensure it is inclusive of the school community. A very small percentage, 5.1%, said they do not at all review their departmental practice. A slightly greater number of participants, at 65.9%, said they were mostly or completely aware of the stereotypes in their resources.
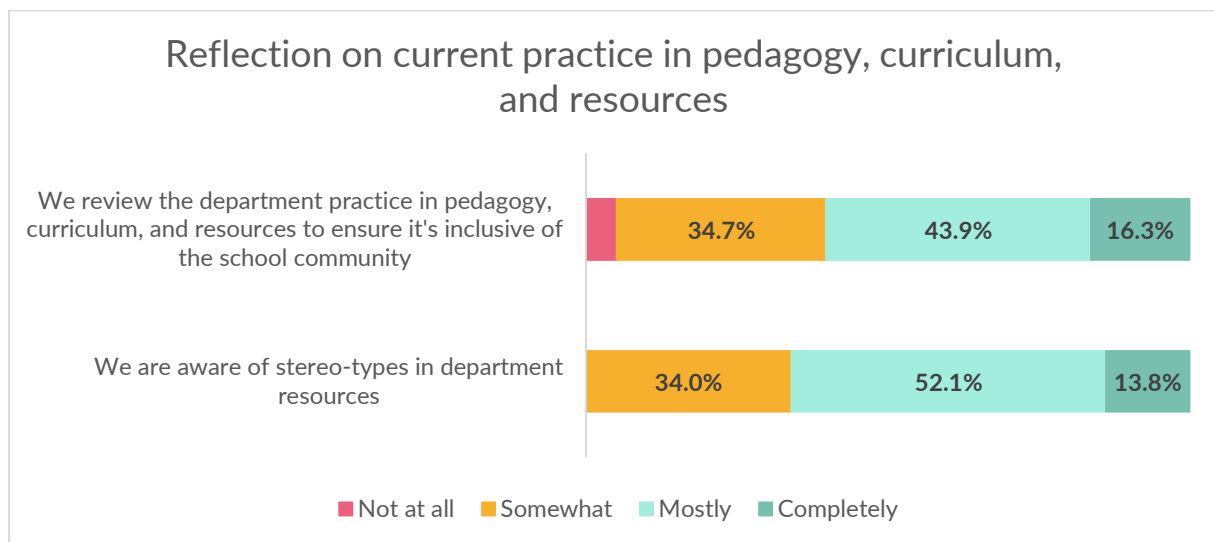
Reflection on current practice in pedagogy, curriculum, and resources

	Somewhat	Mostly	Completely
We review the department practice in pedagogy, curriculum, and resources to ensure it's inclusive of the school community	34.7%	43.9%	16.3%
We are aware of stereo-types in department resources	34.0%	52.1%	13.8%

■ Not at all   ■ Somewhat   ■ Mostly   ■ Completely

Figure 4: Reflection on current practice in pedagogy, curriculum, and resources (n=98)

4. Programme Implementation

This section includes findings from teachers' feedback on programme implementation.

- **95.7%** of the participants found that the quality of the sessions across the six modules was good or very good. (n=516, post-module surveys)
- **84.3%** of the participants rated 4 or 5 stars when asked how much the session would influence their classroom practice. (n=518, post-module surveys)
- **84.2%** of the participants said that the quality of Inclusion in Science CPD programme was good or very good. (n=19, Intended Learning Outcomes survey)
- **89.4%** of the participants agreed or strongly agreed that the Inclusion in Science CPD programme improved their subject knowledge and skills. (n=19, Intended Learning Outcomes survey)
- Qualitative research suggests some participants already have and many participants are likely to share inclusive resources within their departments. These include the Equity Compass, brainstorming tools like Padlet, and specific strategies shared during training. These are earmarked for use in future departmental discussions or CPD sessions.
- Raising awareness on inclusive language, strategies for implementing inclusive language, and challenging non-inclusive language were also the key themes in what participants had shared or would share with their peers at schools. Another small proportion said they won't share anything with their peers yet or at all. This was, in some cases, due to participants wanting to complete the full programme before sharing anything or because they were already implementing inclusive practices at school.
- Participants appreciated the opportunities to interact with fellow participants during the programme. They especially noted the usefulness of breakout groups, sessions led by course leaders, and sessions that facilitated discussions among participants.

Case study: Louise Spencer

Louise is a teacher with 23 years of experience. She has previously worked in a predominantly white, middle-class school and now teaches in a diverse inner-city school in Leeds. Her motivation to participate in the programme came from a desire to ensure that her teaching practices were inclusive and engaging for all students. After years of teaching in less diverse environments, her current role in a diverse inner-city school in Leeds gave her reason to prioritise the need to adapt her teaching methods to be more inclusive. She wanted to verify that her current practices were effective and to gather new ideas to improve inclusivity and student engagement in science.

Louise's primary goals for joining the program were to assess and validate the inclusivity of her current teaching methods and to gather new strategies for making science lessons more inclusive, particularly regarding language and cultural sensitivity. She aimed to find ways to support students with English as an Additional Language (EAL) and those from diverse backgrounds. Additionally, she sought to integrate career education into the science curriculum to make lessons more relevant and engaging for students. Throughout the programme, Louise found all the topics and modules beneficial, particularly those focusing on inclusive practices and bias. The key strategies she implemented include:

▶ **Expert Vocabulary and reflecting on word Etymology**: Introducing expert vocabulary at the beginning of each lesson, explaining the etymology of key terms to help students understand and relate to the material better. This practice was implemented across all year groups from Year 7 to Year 13.

▶ **Dual Coding**: Utilising dual coding by incorporating images alongside text to aid comprehension. This was particularly useful for EAL students and those with lower reading ages. For example, Bunsen Burners and other key pieces of science equipment used in practicals are labelled with both words and pictures.

- ▶ **Career Integration**: Embedding career education into the science curriculum by relating topics to real-world jobs. For instance, the topic of electricity was rebranded as "The Electrician," with lessons linked to practical job roles.
- ▶ **Resource Adaptation for Practical Learning**: Creating sets of trays with science equipment for practical experiments, tailored for students in the school's 'Bridge' (where children who are struggling to attend in lessons linked to behavioural and SEMH needs) and those with special needs. This ensured that all students had access to hands-on learning experiences, even if they were, for some reason, out of the science classroom.
- ▶ **Subtitles and Translation Tools**: Using subtitles in videos and exploring translation tools in PowerPoint to support EAL students, making content more accessible.

One of the main challenges Louise faced was addressing sensitive topics without offending students' religious beliefs. She collaborated with colleagues to carefully phrase content and include factual information respectfully. Another challenge was finding suitable resources to highlight diversity in science. She addressed this by spotlighting diverse scientists and embedding relevant content into the curriculum.

While it's early to measure the full impact of inclusive practices on students, initial observations indicate positive changes. The dual coding strategy and career integration have encouraged more interest and engagement among students. The vocabulary and etymology approach has improved students' understanding of scientific terms. Louise is optimistic that these changes will lead to a more inclusive and engaging learning environment.

The programme has significantly influenced Louise's perspective on inclusion in science education. She realised the importance of making lessons inclusive and relatable to all students. Moving forward, she plans to continue developing and refining inclusive practices, and will embed them into the curriculum for all year groups by 2026. Louise will aim to also seek more resources and examples to further enhance her teaching strategies.

Louise appreciated the structure of the programme, particularly the practical aspects and 'breakout rooms'. Additionally, she suggested providing more ready-to-use resources and ideas to trial in the classroom- as part of the activities participants are asked to carry out during the webinars. Also, she recommended extending the period that the pre-course tasks are available for, to allow more flexibility for participants to complete them.

Case study: Clare Atkinson

Clare is a curriculum leader for science at Marden High school. She has 22 years of experience as teacher in engaging students of all backgrounds in science. She strives to make science relevant and relatable, and this has paid dividends by allowing students to see how the science she is teaching them fits into their world.

She was motivated to participate in the Inclusion in Science Programme to enhance her CPD portfolio and support teachers in their goals of learning more about inclusion in science. After completing the programme, Clare wanted to further strengthen her knowledge and skills of inclusion as well as to support other teachers to do the same for their students. This led her to delivering the course herself.

During the programme, she found the topics of curriculum and careers development, as well as diversifying and decolonising the curriculum, to be the most beneficial. Among the strategies and resources, the EEF and TED talks were particularly enlightening. The programme format, which included workshops, seminars, and online modules, significantly impacted her learning. As a learner, she found it useful to do two modules followed by a seminar, which also supported her in the delivery of the programme. If she could change one thing about the programme, she would probably increase the time given to certain modules or even offer some modules specifically to curriculum leaders and others to early career teachers (ECTs) as they were more relevant to them.

Clare has applied what she learned in the programme to her teaching practice by adapting lessons and resources to enable more inclusive learning, ensuring that groupings and activities allow all learners to participate. In her science lessons, she has integrated inclusive practices by thoughtfully grouping students for discussions and activities, considering their backgrounds, including PP, SEND, female, ethnicity, and any other factors that might be barriers to accessing the activities. However, she has faced challenges in implementing these practices as some staff are not as advanced in their journey of inclusion, leading to resistance to initiatives like mixed prior attainment groups.

Her students have responded positively to the inclusive practices introduced in her science lessons, becoming more engaged and participating fully in activities where they were previously reluctant. These practices have encouraged students to think more deeply about the activities. Clare has noticed anecdotal evidence suggesting increased student engagement, understanding, and achievement. Additionally, more students are considering science pathways for higher education or careers, indicating a shift in their aspirations

The course has significantly influenced Clare's perspective on inclusion in science education. Although she already believed strongly in it, she is now an even more vocal advocate and feels that her practice has been enhanced by participating in and delivering the course. As a science educator, she has become more confident and assertive in advocating for inclusion and actively seeks opportunities to incorporate inclusive practices in her lessons and while leading the department. and interest in furthering their science education.

Clare plans to continue developing and applying inclusive practices in her teaching and in her department or school more widely. She is committed to nurturing and building on what she has accomplished this year and seeks more opportunities to be involved in this work in the future. Currently, she does not feel the need for any additional resources or support to further this work.

5. Conclusion and Recommendations

This section includes a summary of conclusions drawn from the findings and recommendations for the partner.

Conclusion

- **The Inclusion in Science programme is a high quality CPD programme.** An overwhelming majority of the participants found the programme to be of high quality and said it helped improve their subject knowledge and skills. The programme can be therefore of value for future cohorts of participants too.

- **Teachers gained valuable knowledge and skills to build an inclusive culture in their science lessons.** There was a large increase in teachers' knowledge and skills of inclusive practice after the programme. Specifically, appropriate use of inclusive language was successfully implemented by most participants in their teaching. This means teachers leave the programme well equipped to take their learnings back to the classroom.

- **Teachers are confident in building an inclusive culture in their classrooms.** After the programme, an overwhelming majority of teachers reported that they were confident in various aspects of building an inclusive culture, most notably: using inclusive language, challenging non-inclusive/ stereotypical language, making students feel welcome and engaging them in science lessons. This indicates the programme has been successful in achieving one of its key outcomes.

- **Teachers and science departments more widely are reflecting on their current practice.** Participants reported the programme has facilitated and given them tools for reflecting on their practice, with some examples of how they will implement it at a department-level too. The programme therefore is making progress towards the outcome of increased reflection on current practice by science departments which may lead to an impact on a larger scale.

- **The programme was most successful in improving teachers' knowledge about inclusive practice.** Participants saw the largest increase in their knowledge of inclusive practice after the programme. There is scope however for improving confidence in diversifying/decolonising the curriculum and strategies for embedding curriculum review at a department level.

Recommendations for programme delivery

▶ **Continue breakout groups and post seminar discussions and increase time for interaction among participants where possible.** Participants really valued the breakout groups and other interactive spaces in the programme which helped them with sharing ideas, having a safe space, and talking to other teachers.

▶ **Continue providing resources such as the Padlet, Equity Compass, and resources relating to careers.** These were the most frequently rated as useful resources by the participants, and many of them shared these with their peers at school too. Some of

the resources relating to careers were eye-opening for some participants and helpful for promoting careers in an inclusive way back in their classroom or school.

▶ **Consider adding more flexibility in terms of time.** Although participants appreciated the flexibility in general and being able to catch up on the sessions and materials online; some mentioned having an alternative for sessions and having more time to complete pre-reads would be helpful.

Recommendations for evaluation

▶ **Continue qualitative research through interviews and focus groups with participants.** Qualitative research provides rich insight into the experience and impact of the programme and is useful in triangulating quantitative data. We recommend continuing this practice in future evaluations.

▶ **Consider using identifiers for surveys to match pre and post programme surveys.** Analysis of a matched dataset would further strengthen the conclusions. We recommend using identifiers in teacher surveys so they can be matched.

▶ **Embed the data collection in the programme further to gain a higher response rate.** Embedding the evaluation and data collection into the programme by giving dedicated time for participants to complete the surveys and sharing interesting insights from the surveys with them will ensure the response rate is high.

▶ **Consider research with pupils to see if the implementation has been useful for them.** As pupils are indirect beneficiaries of the programme, ASE may find it useful to conduct research into the impact of the similar future programmes through pupils' lens.

6. Appendix

Inclusion Matters questionnaire (baseline)

1 What is your role in school?

   Open response

2 In thinking about your own teaching practice, please rate the following statements:
   •Awareness of your biases
   •Awareness of which pupils are from under-represented groups
   •Using inclusive language appropriately
   •Knowledge of inclusive teaching practices
   •Understanding of the link between positive pupil outcomes & inclusion

   Not at all/ Somewhat/ Mostly/ Completely

3 I feel the diversity of pupils within my school and within wider society is reflected in my lessons
   1-Strongly disagree 2-Disagree 3- Neutral 4- Agree 5- Strongly Agree

4 If you would like to provide further details regarding your answer above, please use the space provided.
   Open response

5 Are there any group(s) of students who regularly struggle to engage in your lessons or maintain a positive attitude to learning in science? Please give details.

   Open response

6 I feel I create an inclusive environment that caters well for all pupils and enables all pupils to participate
   1-Strongly disagree 2-Disagree 3- Neutral 4- Agree 5- Strongly Agree

7 How clearly do you feel your science department communicates its vision for inclusion?
   Not at all/ Not very/ Somewhat/ Very

8 In thinking about your department's approach, please rate the following statements:
   •We use inclusive language appropriately
   •We challenge discriminatory language
   •We challenge stereotypes used in language of both staff and students
   •We make links between the curriculum and careers
   •We advise pupils on subject choices (GCSE, A-Level)
   •We are aware of stereo-types in department resources
   •We ensure all department resources are representative of diversity

   1-Strongly disagree 2-Disagree 3- Neutral 4- Agree 5- Strongly Agree

9 To what extent do you feel your science department creates an inclusive environment that caters well for all pupils

   Not at all/ Somewhat/ Mostly/ Completely

Inclusion Matters questionnaire (final)

1 What is your role in school?

   Open response

2 In thinking about your own teaching practice, please rate the following statements:
   •Awareness of your biases
   •Awareness of which pupils are from under-represented groups
   •Using inclusive language appropriately
   •Knowledge of inclusive teaching practices
   •Understand-ing of the link between positive pupil outcomes & inclusion

   Not at all/ Somewhat/ Mostly/ Completely

3 I feel the diversity of pupils within my school and within wider society is reflected in my lessons

   1-Strongly disagree 2-Disagree 3- Neutral 4- Agree 5- Strongly Agree

4 If you would like to provide further details regarding your answer above, please use the space provided.

   Open response

5 What group(s) of students do you think could be more thoughtfully included in your personal practice?

   Open response

6 I feel I create an inclusive environment that caters well for all pupils and enables all pupils to participate

   1-Strongly disagree 2-Disagree 3- Neutral 4- Agree 5- Strongly Agree

7 What benefits do you see of incorporating inclusive practice into science lessons?

   Open response

8 I'm confident in the below skills required to creating an inclusive environment/culture in my science lessons:
   •Using inclusive language
   •Engaging students in science lessons
   •Making students feel welcome in science lessons
   •Diversifying and/or decolonising the curriculum
   •Challenging non inclusive/stereotypcial language
   •Identifying strategies to mitigate the impact of unconscious biases on students

   Not at all/ Somewhat/ Mostly/ Completely

9 In thinking about your department's approach, please rate the following statements:
   •We are aware of stereo-types in department resources
   •We review the department practice in pedagogy, curriculum, and resources to ensure it's inclusive of the school com

   Not at all/ Somewhat/ Mostly/ Completely

Intended Learning Outcomes survey (baseline)

1   How would you rate your current understanding of the CPD topic?
    - I am completely new to the topic
    - I have basic understanding of the topic
    - I have some understanding of the topic
    - I have good understanding of the topic

2   **As the result of this CPD I would like to be able to:**

    - Develop understanding of why inclusion is important for all students and how this knowledge can be used effectively.
    - Understand why it's harder for some groups of students to engage in science
    - Be able to give every child a welcoming space to explore science and develop their learning
    - Use the curriculum and pedagogy to promote diversity and challenge bias
    - Be able to widen and broaden the aspirations of students and help them see the possibilities available to them in science
    - Please use the space below to record any additional intended outcomes

3   **Are there any areas you're particularly looking forward to, or want to focus on?**
    Open response

Intended Learning Outcomes survey (final)

1   How would you rate the overall quality of the CPD you have attended?

    - Satisfactory
    - Good
    - Very good

2   How useful did you find module 1: Introduction to Inclusion?

    - Slightly useful
    - Moderately useful
    - Very useful

3   How useful did you find module 2: Bias in the Classroom?

    - Slightly useful
    - Moderately useful
    - Very useful

4   How useful did you find module 3: Inclusive Language?

    - Slightly useful
    - Moderately useful
    - Very useful

5   How useful did you find module 4: Inclusive Practice in the Science Classroom?

- Slightly useful
- Moderately useful
- Very useful

6   How useful did you find module 5: Developing an Inclusive Curriculum?

- Slightly useful
- Moderately useful
- Very useful

7   How useful did you find module 6: Engaging Young People to Take Science Further?
- Slightly useful
- Moderately useful
- Very useful

8   Could you tell us a bit more about your CPD experience?
- The CPD was well organised and planned
- The CPD was relevant and useful
- Learning outcomes for this CPD were met
- It has improved my subject knowledge and skills

9   How could this CPD be improved?
Open response

10 How would you describe its future use and impact?

- The CPD will have impact on my future practice
- The CPD will have impact on the students I teach
- I will share this learning with other colleagues (in our school, school grouping or in other schools)

11 How would you rate your confidence in the topic of your CPD before the course?

- Not at all confident
- Slightly confident
- Somewhat confident

12 How would you rate your confidence in the topic of your CPD now?

- Not at all confident
- Slightly confident
- Somewhat confident

13 Any other comments or suggestions?
Open response

14 How did you hear about this CPD?
- The Association of Science Education website (www.ase.org.uk)
- STEM Learning website (www.stem.org.uk)
- Via a colleague/friend
- Don't know/can't remember
- Other - Write In

15 Alongside using your comments to improve our offer, we may wish to use positive comments you've supplied to promote our CPD in marketing and publicity. This may include but is not limited to publications on the STEM Learning website (www.stem.org.uk), within online community group posts, and on official STEM Learning social media. Please use the boxes below to indicate whether you would be happy for us to use your anonymised comments for marketing and publicity-related purposes:

- Yes, I am happy for my comments to be used for marketing and publicity purposes
- No, do not use my comments for marketing and publicity purposes

Post-module survey

1 How would you rate the overall quality of the session?
Poor/ Satisfactory/ Good/ Very good

2 How much do you think the session will influence your classroom practice?
1-5 stars

3 What did you find most useful? What one thing will you change after this session?
Open response

4 Is there anything from this session that you will share with your colleagues?
Open response

Interviews and focus group topic guide

Welcome everyone and thank you for making the time to stay after your session for this focus group. My name is Roisin and this is Dee, we work together on evaluation for the Inclusion in Science programme. The purpose of this focus group is to gain valuable feedback from you on different aspects of the programme and your experience of it. It will last for 20-30 minutes. Dee and I will ask questions and ensure you all have the opportunity to share your thoughts and opinions. We will also record the session using a speech to text app so we can capture your feedback accurately. My first question is whether anyone would like to be anonymous in their responses today? I will make a note of that now or you can tell us at the end – if you decide you want to be anonymous within the next week, you can also email inclusion in schools. We will also be sending out the survey you filled in at the beginning of the programme out again to capture any change that has occurred as a result of completing the programme.

Introduction (5 mins)

The course – 15 minutes (What is effective CPD? Build knowledge, motivation, teaching techniques, embed practice)

General questions about the course:

1. If you were to describe this course to a friend, what would you say?

     a. Your experience of: course materials, module content, environment (inclusive?), communications with us

2. As a result of the course, what will you change about your teaching practice – however big or small?
   a. How do you envisage passing on what you have learnt to your wider school context (B3)?
   b. How will you translate theory into practice, and if you have started to do this already, what have you done?
3. How will (or has) what you have learnt impact(ed) on your students in science?
   a. Those most hard-to-reach, have strategies been provided?
4. If you were to run the course, what would you do differently?
   a. Embedding affirmation and reinforcement after progress (B5) and feedback (C9) – e.g. at seminar
   b. Buddying system suggestion (C7 and 9), D14

Aspects of this course – for future iterations:

5. How did you find different aspects of the course?
   a. e.g. webinar, tasks, workbook, padlets, SIF? (Post-course task better?)
   b. Does it refer to previous learning enough (A2) (C6, 8 and 10), D12? D11, 13
   c. Were there enough sources of research and evidence and which, if any, were the most useful to you? (B4)
   d. Overall amount of information provided – which were the most useful aspects of the additional material provided? (A1)?
6. How did you engage with leadership pathway? Aspiring leader – helpful for progression? Current leader – how will it help move inclusion forward in the department or whole-school?
7. *Optional question: logistics, groupings, communication, process of applying, onboarding*
8. *Optional question: how did you find the length of the course and number of sessions? Was there enough time between sessions to try things out in the classroom?*

Policy questions (5-10 minutes)

9. What are the main barriers to inclusive science education in your school and in wider society?
10. *Optional question: If you were able to provide feedback to a policy maker, for example the DfE, around inclusion – what feedback would you give them?*

Case study questions

Background

▶ Teacher name
▶ Photo (good to have, not a must)
▶ Role
▶ School name

- ▶ Years of teaching experience
- ▶ Summary of what their teaching experience has been so far, especially with inclusion and getting students engaged in science

Motivation

- ▶ What motivated you to participate in this programme?
- ▶ What specific goals did you have at the beginning of the programme?

Programme

- ▶ Which topics or modules did you find most beneficial and why?
- ▶ Were there any particular strategies or resources that stood out to you?
- ▶ How did the programme format (e.g., workshops, seminars, online modules) impact your learning?
- ▶ If you could change one thing about the programme, what would it be and why?

Application in the classroom/ more widely

- ▶ How have you applied what you learned in the programme to your teaching practice?
- ▶ Can you provide examples of inclusive practices you have integrated into your science lessons?
- ▶ Have you embedded any inclusive practices at a department or school level? If yes, could you give us examples?
- ▶ What challenges have you faced in implementing these practices?

Impact on students

- ▶ How have your students responded to the inclusive practices introduced in your science lessons?
- ▶ Have you noticed any changes in student engagement, understanding, or achievement? Are there students who are considering science pathway for higher education or in their career?

Personal reflections

- ▶ How has the course influenced your perspective on inclusion in science education?
- ▶ Could you summarise the impact it has had on you as a science educator?

Forward look

- ▶ How have you embedded inclusive practices in your classroom, could you give us examples?
- ▶ How do you plan to continue developing and applying inclusive practices in your teaching and in your department or school more widely?
- ▶ Are there any additional resources or support you feel you need to further this work?

7. Tables and figures

8. Glossary

Evaluation terminology

Baseline

The initial assessment of teacher knowledge, skills, and feedback at the start of an evaluation.

Evaluation

An evaluation is set up to measure the impact of a particular programme. This will involve monitoring the programme over a specified period, for one or more groups, in order to evaluate the progress participating pupils make. One programme can involve multiple evaluations, and we recommend gathering data across multiple time points to ensure valid and reliable results are generated.

Final

The final assessment of teacher knowledge, skills, and feedback at the end of an evaluation.

Outcomes

We use outcomes to refer collectively to any social and emotional skills and academic attainment scores that are being measured over the course of an evaluation.

Programme

Inclusion in Science programme delivered by Association for Science Education (ASE).

Supporting our purpose driven partners to make better decisions using high quality evidence.

Get in touch

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