Education Endowment Foundation

ASCENTS 1-2-1 Support for Science

Evaluation report

July 2026

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National Centre for Social Research

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Acknowledgements

We would like to thank the developer and delivery team for being thoughtful, curious collaborators on this project. We are also especially grateful to the school lead teachers, pupils, and mentors who took part in this study and generously shared their views and experiences with us. Finally, thanks to colleagues at the Education Endowment Foundation for their support throughout.

Executive summary

The project

ASCENTS 1-2-1 Support for Science (ASCENTS) involves pairing Year 11 pupils who are eligible for Pupil Premium, age 15 to 16-years old, (mentees) with science, technology, engineering, and mathematics (STEM) university undergraduate students as mentors. Mentoring is intended to be delivered over 23 weekly in-person sessions throughout Year 11. After the mentoring sessions are completed and before GCSE exams, mentees are also expected to attend a Revision Day at their local university. The programme's primary aims are to improve science attainment for Year 11 pupils, from disadvantaged backgrounds and motivate them to study science after GCSEs. The programme was delivered by the University of Roehampton in partnership with the University of Lincoln, the University of Liverpool, Northumbria University, Anglia Ruskin University, the University of Hull, and Plymouth Marjon University.

The programme was evaluated through an efficacy trial during the 2023/2024 academic year. The evaluation design was a two-arm randomised controlled trial (RCT) and an implementation and process evaluation (IPE). This was a multi-site trial, with schools as the sites and pupils randomised within each site. A total of 57 schools took part in the trial and the final sample for analysis included 340 pupils who were eligible for Pupil Premium in the intervention group and 350 in the control group. The primary outcome was the attainment of pupils in GCSE combined science (double award). Secondary outcomes included maths GCSE attainment, English GCSE attainment, and progression to science A level or AS level. Subgroup analysis for the primary outcome was carried out for pupils who were eligible for free school meals (FSM), which included 83.2% of the main sample (with 16.8% of pupils eligible for Pupil Premium for other reasons). Research methods used in the IPE were observations, interviews, focus groups, surveys, and analysis of programme monitoring data. Additionally, a follow-up study will be conducted to evaluate the programme's impact on mentees' choices to study science after GCSEs and mentors' choices on whether to pursue training or a career in teaching through a follow-up longitudinal study that will be published in 2027 and 2029. Key conclusions are presented in Table 1 below.

Table 1: Key conclusions

	Key conclusions
1.	Pupils allocated to receive ASCENTS made, on average, two additional months' progress in science attainment compared to pupils receiving business as usual science provision. This result has a moderate to high security rating.
2.	Pupils allocated to receive ASCENTS made, on average, one additional month's progress in maths attainment compared to pupils receiving business as usual science provision. For English attainment, pupils allocated to receive ASCENTS made, on average, no additional month's progress compared to pupils receiving business as usual science provision.
3.	For mentees and mentors who reported positive experiences with ASCENTS, high-quality relationships and good rapport were considered key factors, which influenced positive engagement and perceived outcomes. Negative views from both mentees and mentors often related to absenteeism resulting in unstable mentor–mentee pairings and practical challenges of taking part in the programme.
4.	University partners and school leads considered ASCENTS to be an appealing offer, but also burdensome to deliver. It was challenging to deliver the programme with fidelity. Most notably, mentor–mentee pairings often changed, Revision Days were not delivered as intended, and the amount of ongoing support that mentees were offered by university partners varied.

EEF security rating

These findings have a moderate to high security rating. This was an efficacy trial, which tested whether the intervention worked under developer-led conditions in a number of schools. The trial was a well-designed two-armed RCT, with randomisation at pupil level. The trial was well-powered. The pupils who took part in ASCENTS were similar to those in the comparison group in terms of prior attainment. However, the following factors reduced the security of the trial. Around 17.76% of pupils who started the trial were not included in the final analysis because of school withdrawals and non-consent to process pupil data. Some elements of the programme were not delivered as intended, including Revision Days and consistency in mentor–mentee pairings, which makes it harder to accurately estimate the size of the impact on the pupils in the trial.

Additional findings

Pupils allocated to receive ASCENTS made, on average, two additional months' progress in science compared with pupils receiving business as usual science provision. This is our best estimate of impact, which has a moderate to high security rating. As with any study, there is always some uncertainty around the result: the possible impact of this programme also includes small negative effects of one month's less progress, no effect, and positive effects of up to three months' additional progress. This means that the evidence from this trial is inconclusive with regards to the impact of ASCENTS on science attainment. This uncertainty was also true of the results for the secondary outcomes of maths and English attainment, where plausible impacts ranged from small negative to positive effects.

The IPE results include mixed views and experiences of how ASCENTS was delivered and its perceived impact on outcomes. It was delivered with moderate levels of fidelity, most notably in that absenteeism resulted in mentor–mentee pairings frequently changing and the Revision Days were largely not delivered. There was also variation in ongoing support that mentors received during the intervention period. Both the type and amount of support varied above the minimum requirement of one meeting per term. A maximum frequency of meetings or other support engagements was not defined in the delivery model.

Mentors and mentees with positive views about ASCENTS tended to emphasise the quality of relationship that they had with their mentor(s)/mentee(s). Negative views often related to absenteeism and practical challenges, such as scheduling conflicts with other priorities. Mentors perceived the pay to be low and required commuting time to schools challenging to manage.

The evaluation results support two key aspects of the logic model. First, sustained high-quality relationships, when present, were considered key drivers for both mentors' and mentees' engagement and benefits of the programme. Finally, at recruitment, schools considered ASCENTS to be an appealing offer, however this view is counterbalanced with feedback that delivery could be administratively burdensome.

Research suggests mentoring can yield small positive effects, especially when mentor–mentee relationships are strong. The Education Endowment Foundation (EEF) Teaching and Learning Toolkit[1] indicates mentoring may improve attainment by an additional two months' progress, though impacts tend to be higher for maths than on science or reading outcomes. ASCENTS mentees showed similar progress in science. The IPE found that mentors and mentees were more likely to report positive experiences when they experienced stable, positive mentor–mentee pairings. Conversely, mentors dropping out of programmes were associated with negative experiences for mentees. In considering the evaluation results with the literature, ASCENTS' impact may have been reduced by mentor and mentee absenteeism leading to frequent changes in pairings during delivery.

Cost

Overall, the average cost of delivering ASCENTS was £609.90 (including the Revision Day) or £596.30 (excluding the Revision Day) per pupil per year when averaged over three years. ASCENTS is therefore, deemed to be a moderate cost programme.

Impact

Table 2: Summary of impact on primary outcome(s)

Outcome / group	Effect size (95% confidence interval)	Estimated months' progress	EEF security rating	No. of pupils	P-value	EEF cost rating
GCSE science attainment – Pupils eligible for Pupil Premium	0.10 (-0.05, 0.25)	2 months	🔒🔒🔒🔓🔓	690	0.144	£ £ £ £ £

[1] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit

Introduction

This report presents the results of an efficacy trial for ASCENTS 1-2-1 Support for Science (ASCENTS). The programme paired science, technology, engineering, and mathematics (STEM) undergraduate university students with Year 11 GCSE pupils eligible for Pupil Premium. It aimed to improve pupils' GCSE scores and increase aspirations to pursue science after GCSEs.

ASCENTS was developed at the University of Lincoln by Professor Ian Abrahams. For this trial, delivery and evaluation were funded by the Education Endowment Foundation (EEF), through the Department for Education (DfE) Accelerator Fund.[2] The intervention was evaluated by the National Centre for Social Research (NatCen).

This efficacy trial involved a two-arm randomised controlled trial (RCT) with science GCSE scores as the primary outcome measure and an integrated mixed-method implementation and process evaluation (IPE). Data were collected from university partners, school leads, mentors, mentees, and students in the control group. A cost evaluation was conducted using cost pro-formas completed by university partners and schools to determine the per student cost to deliver the intervention. A follow-up study is being conducted to evaluate whether ASCENTS has influenced mentees uptake of science A levels and mentors' further education and career choices. These findings will be published in 2027 and 2029, respectively.

Background

This section presents the policy and practice context in England for ASCENTS and summarises the evidence of the impact and outcome pathways of mentoring and tutoring programmes in educational settings. It also highlights where additional research is needed, providing a rationale for this trial.

In both the literature and in practice, 'mentoring' and 'tutoring' have distinct definitions. The EEF Teaching and Learning Toolkit defines one-on-one tuition as involving a teacher, teaching assistant, or other adult providing a pupil with intensive, individual support. It can be delivered one-on-one or small group settings.[3] Peer tutoring, however, is a form of tutoring where the tutor is not a professional. This, as defined by the EEF, involves learners being paired for teaching support where a tutor takes on aspects of teaching another learner and evaluating success.[4] Mentoring in education is defined by the EEF in the Teaching and Learning Toolkit as 'pairing young people with an older peer who acts as a positive role model'.[5] Mentoring can include academic support, and this is sometimes referred to as 'academic mentoring'. In this chapter, we present evidence related to both mentoring and tutoring as it is relevant to the ASCENTS intervention. There are more similarities between ASCENTS and peer tutoring than other forms of one-on-one tuition.

ASCENTS is an academically asymmetrical paired mentoring programme, which means that mentees are paired with a mentor who is at a higher academic level. It is distinct from tutoring because the mentors are not professionals, and they have a larger age gap from mentees that would be typical of peer tutoring. ASCENTS does, however, include subject-specific support similar to that provided in tutoring programmes in addition to relational support aimed at building confidence and raising aspirations.

An efficacy trial was previously commissioned by the EEF to evaluate delivery of ASCENTS during the 2019/2020 academic year. Disruption as a result of the Covid-19 pandemic meant that no regular GCSE examinations took place during 2020. GCSE grades were instead awarded based on teacher submissions, referred to as centre assessment grades (DfE, 2020). This meant that the evaluation could not use the 2020 grading system reliably and the impact evaluation was therefore, cancelled. The IPE was still carried out. Changes to the programme design that evaluation recommended were to provide mentors with teaching resources and guidance for how to engage shy or unmotivated mentees and to offer structured, rather than ad hoc, on ongoing support to mentors, however, these were not implemented as part of the ASCENTS design. The evaluation also recommended to conduct a survey with pupils from the control group and observe mentoring sessions

[2] ASCENTS is part of a wider DfE funded programme called the 'Accelerator Fund', which aims to increase access to evidence-informed programmes.
[3] See; https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/one-to-one-tuition
[4] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/peer-tutoring
[5] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/mentoring

(Scandone *et al.,* 2021). These recommendations informed both adaptations to the ASCENTS programme and the evaluation protocol for this trial.

Policy and practice context

In 2021, England saw the largest annual increase in the attainment gap for pupils from disadvantaged backgrounds in over a decade (Tuckett *et al.*, 2022). According to the DfE's disadvantage gap index, the disadvantage gap was at its widest since 2010/2011 in 2022/2023, the academic year prior to this trial. The data also shows that 45% of pupils were awarded a grade 5 or above in both English and mathematics, which was down from 49.8% in 2021/2022. Of those pupils, only 25.2% of pupils from disadvantaged backgrounds received a grade 5 or above compared to 52.4% of all other pupils (DfE, 2024). The Education Policy Institute's (EPIs) report found that this stalling of reducing the attainment gap had occurred before the Covid-19 pandemic (Hutchinson *et al.,* 2020). The EEF rapid evidence review, conducted in 2022, found that school disruption related to the pandemic had negatively impacted the attainment levels of all pupils, but had had a particular effect on pupils from disadvantaged backgrounds (EEF, 2022a). The EPI's 2025 report found that, in addition to prior attainment, pupil absence, and peer effects, that is pupils learning alongside other middle to low attaining pupils, are key contributing factors to the attainment gap (EPI, 2025).

Research that contributed to the EEF guidance report for improving secondary science (EEF, 2018) found that pupils often do not feel engaged with science subjects at school. The report defines engagement as being able to see the relevance of science in their lives. Additional research demonstrates that attitudes towards science have been seen to decline as pupils progress through primary and secondary school (Smith *et al.,* 2026; García-Pérez and Peñaloza, 2025) and interest in pursuing a career in science can be cemented during adolescence (Zhou and Shirazi, 2025). Pupils from disadvantaged backgrounds are less likely to pursue science after compulsory secondary education that their more socio-economically advantaged peers (Mujtaba *et al.,* 2018).

Evidence in the EEF's Teaching and Learning Toolkit[6] indicates that **mentoring** is not as effective in raising attainment outcomes as tutoring, on average, however, it can be beneficial for pupils from disadvantaged backgrounds. This is because these pupils particularly benefit from the relationships with an adult or older peer who provides support. Mentoring can have small positive impacts on attainment (two or more months' additional progress), but that effects tend not to be sustained after mentoring stops. Impacts tend to be higher for maths than on reading or science outcomes. Some studies found negative impacts, with mentor dropout having a particularly detrimental effect on mentee outcomes. **Peer tutoring** approaches can have a positive impact on learning, and on average can increase learning by five additional months' progress, particularly if it is high quality and aligned with the classroom curriculum (EEF, 2022b).

During the 2020/2021 academic year, the DfE launched the £350 million National Tutoring Programme (NTP). It was designed to provide a sustained response to the Covid-19 pandemic and aimed to reduce the attainment gap (DfE, 2022). There were three components to the NTP:

- **Tuition partners.** Offered schools access to subsidised, high-quality tuition from an approved list of providers.
- **Academic mentors.** Placed trained graduates in schools in the most disadvantaged areas to provide intensive support to their pupils.
- **School-led tutoring route.** Gave schools a direct, ring-fenced grant from the DfE to spend on local tutoring provision. It gave schools more flexibility and autonomy to best meet the needs of their pupils.

The NTP was extended and ran through the 2023/2024 academic year. The programme had some similarities to ASCENTS, in that some (but not all) tutoring and mentoring was one-on-one, and science was one of the subjects where support was provided, though this had limited uptake. In the first year of the evaluation, only 3% of pupils received science support through tuition partners and 15% through academic mentors (Coulter *et al.,* 2022; Teach First, 2021). The year three IPE of

[6] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/mentoring

the NTP, it was reported that 1% used NTP for support for science, and this was all in primary schools (Lynch *et al.,* 2023). Similarly, schools participating in the NTP were encouraged to target pupils from disadvantaged backgrounds to offer support. However, schools had freedom to select which pupils they felt would most benefit from tutoring or mentoring. Due to this flexibility, during 2023/2024, 45% of pupils who participated in the programme had been eligible for free school meals (FSM) in the last six years, and 28% had Special Educational Needs and Disabilities (SEND) (DfE, 2024). This evaluation considered if and how schools participating in ASCENTS made use of the NTP and explored any overlap between the two interventions.

Findings from other ASCENTS evaluations

ASCENTS was first evaluated as a small-scale pilot trial that employed pupil-level randomisation within four schools (n=86, Year 11 pupils) (Sharpe *et al.,* 2018). The authors found evidence of a positive impact. The findings showed that mentees achieved better attainment in science in both mock and actual GCSE examinations with an effect size of 0.3 standard deviations (SDs).

The IPE from the 2019/2020 efficacy trial found that the programme was well-received by school leads, mentees, and mentors and that it was feasible to implement with fidelity. Teachers and pupils had mixed views on the perceived outcomes of ASCENTS on pupils' grades. Most mentees (90.8%) agreed that ASCENTS would improve their GCSE science grades. Less than half (44.4%) of school leads reported improvements to mock science grades as a perceived benefit of taking part in ASCENTS. Mentees' interest in pursuing science after GCSE's however, remained largely unchanged (Scandone *et al.,* 2021). The statistical impact of the programme on science, mathematics, and English GCSE attainment could not be tested due to the impact evaluation being cancelled.

The 2019/2020 ASCENTS IPE found that most mentors indicated that the experience had improved their CV and supported development of 'soft skills', such as confidence (Scandone *et al.,* 2021). They also referred to socialising with other mentors as a benefit of taking part in the programme. More than half of the mentors said participating in ASCENTS had increased their interest in a teaching career or a career supporting young people from disadvantaged backgrounds (Scandone *et al.,* 2021).

A longitudinal mentor follow-up study was conducted with the mentors who took part in the 2019/2020 ASCENTS trial and is also planned for this trial. This included a follow-up survey with mentors after they had graduated and analysis of administrative data on mentors from the Initial Teacher Training Performance Profiles (ITTPP) and the School Workforce Census (SWC), alongside pre- and post-intervention surveys measuring mentors' interest in pursuing a teaching career at baseline and post-intervention. The ITTPP includes information on routes into Initial Teacher Training, while the SWC identifies all teachers working in state-funded schools in England. Out of the 341 ASCENTS mentors who took part in the programme, 9% (n=31) enrolled in Initial Teacher Training. Of the 219 mentors who completed the follow-up survey, more than half (56%) reported that taking part in ASCENTS had positively influenced their interest in teaching (Scandone *et al.,* 2021). For this evaluation, the follow-up study will be replicated. Pre- and post-intervention mentor survey data on interest in pursuing a teaching career, alongside a follow-up survey administered one year after graduation and national administrative data on progression into teaching, will be analysed to examine changes in career interest over time and their relationship to subsequent entry into the profession. Findings from this follow-up study will be published as an addendum to this report in spring 2029.

Theoretical rationale for ASCENTS

The ASCENTS programme was developed to provide cost-effective one-on-one mentoring to increase science attainment. An element which makes ASCENTS a mentoring programme, rather than tutoring, is that sessions are not delivered by teachers or other professional adults (one-on-one tuition) or peers (peer tutoring). The subject focus and preparation work are aspects of ASCENTS which resemble tutoring, however, the relational and aspirational aims for the intervention are more often associated with mentoring.

In line with other one-on-one tutoring and mentoring programmes in the UK and internationally, ASCENTS also aimed to improve pupils' attitudes towards science and learning. The rationale for using university undergraduate (or integrated masters[7]) students as mentors was that they could be inspirational role models to their mentees.

Impact of mentoring and tutoring on attainment

Evidence from meta-analyses show that one-on-one tuition is effective, resulting in moderate effects on pupil attainment across a range of outcomes and ages (Jun *et al.,* 2010; Kunsch *et al.,* 2007; Hidayat and Saad, 2025). There is also evidence to suggest that one-on-one tuition is particularly effective for low income, younger, urban, and minority ethnic pupils (Leung, 2015; Leung, 2018; Rohrbeck *et al.,* 2003). There is also evidence that tutoring can especially benefit pupils from disadvantaged backgrounds and with low attainment (Burns *et al.,* 2010; Dietrichson *et al.,* 2017; Torgerson *et al.,* 2018; Nickow *et al.,* 2020; Ashraf *et al.,* 2021; Offordile *et al.,* 2021), however, cost can be a barrier (Jerrim, 2017; The Sutton Trust, 2019). According to DfE, around 80% of pupils from disadvantaged backgrounds in 2022 did not have access to quality tuition (DfE, 2022).

The evidence on the effects of mentoring on academic attainment is more mixed than the evidence for tutoring. A meta-analysis of 55 evaluations of 'youth mentoring' found that there was a modest or small benefit of programme participation on academic performance, and slightly stronger effects were found for those from disadvantaged backgrounds. The meta-analysis also found that programme effects were enhanced when strong relationships are formed between mentors and mentees (DuBois *et al.,* 2002; DuBois *et al.,* 2011). A systematic review that explored the effects of school-based mentoring found a number of studies where small and medium effects were observed on outcomes such as academic performance, school functioning (e.g. social and cognitive skills associated with school performance), and psychological well-being, among others (Tiraieyari and Krauss, 2026). Another meta-analysis, however, which looked specifically at school-based mentoring, found no effect on academic performance (Wood and Mayo-Wilson, 2012). Evidence from single studies also found little evidence of positive effects on academic performance, including science, maths, and English attainment (Bernstein *et al.,* 2009; McQuillin *et al.,* 2011; McQuillin *et al.,* 2015).

Impact of mentoring and tutoring on mentees' study choices

There are few studies that have evaluated the effect of mentoring and tutoring on study choices in the UK. A small-scale pilot study involving ten schools found that pupils were more likely to choose modern foreign languages (MFL) GCSEs when they were paired with a university student mentor who was reading MFL. Just over half of the students who took part in the mentoring scheme indicated that they were intending to take a MFL GCSE courses, and most participating teachers felt that the programme had been effective at improving pupils' intentions to take MFL at GCSE (Thomas and Rushton, 2020). This study is limited, however, by its small sample size and lack of counterfactual.

Impact of mentoring and tutoring on mentors'/ tutors' interest in entering teaching

Leavitt *et al.* (2022) conducted a systematic review of literature on the effects of STEM mentoring programmes on mentors that focused on undergraduate or post-secondary students acting as tutors, pedagogical mentors, and/or teaching assistants. Several studies included in the review found increased interest among mentors in pursuing teaching careers and the development of relevant skills. For example, Hemmerich *et al.* (2015) found that STEM undergraduate students expressed greater interest in academic careers and reported improved communication skills and appreciation of teaching after participating in a teaching experience. Finkel (2017) similarly found that most undergraduate mentors were more interested in and likely to pursue teaching careers after participating in a STEM mentoring programme. Other studies, such as Hryciw *et al.* (2013), found self-reported improvements in teaching-related skills, including increased comfort and confidence in STEM disciplines. Diaz *et al.* (2019) noted enhanced self-awareness and teaching skills among mentors in subjects of anatomy, physiology, and nutrition, including better content delivery, student engagement, and classroom

[7] Typically, an integrated master's degree is a four-year programme which combines undergraduate and postgraduate study into a single course. These tend to be popular among STEM based degrees.

management. Najmr *et al.* (2018) also observed improvements in mentors' abilities to identify key teaching competencies and communicate scientific concepts.

A programme called the Academic Mentoring Programme (AMP) was part of the NTP and delivered by Teach First. Academic mentors were hired by state-maintained primary and secondary schools as full-time employees and were required to hold qualified teacher status or a degree at a 2:2 or above in a subject relevant to the subject they would mentor in. They provided one to one and small group support aimed at increasing pupil attainment across a range of subject areas, including science. An impact evaluation was delivered by the National Foundation for Educational Research (NFER) and University of Westminster (Roy *et al.,* 2022) and Teach First delivered their own process evaluation. The process evaluation found that 88% of academic mentors agreed that participating in the programme influenced their career aspirations, with many feeling motivated to continue working in a school or enter/return to teaching (Teach First, 2021). Another small mixed-method study explored the impact on secondary school pupils' motivation when they were paired with university student mentors. While the quantitative results were not significant, the themes that emerged from the qualitative data were strengthened future orientation, improved planning and learning strategies, and positive affirmation from mentors (Schenk *et al.,* 2026).

Four evaluations explored the impact of 'near-peer'[8] teaching programmes in medical schools. One such study found that 91% of tutors who took part in a scheme agreed that being a tutor made them consider pursuing teaching in the future (Khalid *et al.,* 2018). Others found that participants who were already considering making teaching part of their future career path, felt more prepared for teaching and would recommend tutoring to others (Rodrigues *et al.,* 2009). Similarly, another study found an increased interest in teaching among tutors because they felt that tutoring had improved their confidence and communication skills (Buckley and Zamora, 2007). One study, however, found that tutors did not report an increased interest in teaching, in part because they felt that the programme did not improve their CV (Liew *et al.,* 2015).

Integrated evaluation design

The evaluation of ASCENTS was designed as a two-arm multi-site RCT, with pupils as the unit of randomisation and analysis. In total, 839 pupils from 64 schools in England were recruited. Pupils within each participating school were randomly allocated to either the ASCENTS mentoring group or the control group. The primary outcome of interest is GCSE science attainment, using GCSE grades from the National Pupil Database (NPD). The secondary outcomes of interest were GCSE maths and English attainment and progression to science A level or AS level.

A mixed-method IPE was designed alongside the impact evaluation, assisting in contextualising and improving our understanding of the impact (or lack thereof) of ASCENTS. The IPE included surveys, interviews, and focus groups with the delivery team and participants as well as observations of key activities. Analysis of the two strands (the IPE and impact evaluation) was carried out independently of each other in order to avoid one set of findings influencing analysis or interpretation of the other. The findings from the IPE and impact evaluation analyses were integrated in the 'Conclusion' section of this report.

This integrated evaluation design is the most robust method for assessing the impact of the ASCENTS programme. This design minimises selection bias and ensures that differences in outcomes can be attributed to the programme itself. This evaluation, therefore, provides valuable insights into a field where experimental evaluations are limited, thereby significantly contributing to the existing body of literature.

Intervention

This chapter presents a description of ASCENTS using the Template for Intervention Description and Replication (TIDieR) checklist.[9]

Who: Implements

[8] Near-peer teaching is where the tutor is one or more academic years ahead of the person being tutored.
[9] See: www.bmj.com/content/348/bmj.g1687

Professor Ian Abrahams, in post at University of Lincoln, developed ASCENTS. He led a pilot delivery and evaluation of the programme in 2018 and the delivery of the programme for the 2019/2020 efficacy trial when he was in post at the University of Lincoln. He also led ASCENTS delivery for this trial, but in post at the University of Roehampton.

University partners from the University of Lincoln, the University of Liverpool, Northumbria University, Anglia Ruskin University, the University of Roehampton, the University of Hull, and Plymouth Marjon University delivered ASCENTS. Each university co-ordinated ASCENTS activities with mentors and local schools.

Each school had a school lead who served as the main point of contact for the university partners and was responsible for co-ordinating mentoring activities within their school, including pupil recruitment and delivery of mentoring sessions.

Professor Abrahams and the university partners delivered training to the mentors.

Who: Participants

ASCENTS participants included schools, mentors, and mentees. Undergraduate STEM students provided science mentoring to Year 11 science GCSE pupils from disadvantaged backgrounds.

Schools had to meet the following criteria:

- be a non-selective, state school in England;
- be located within the vicinity of the university partners in London, Lincoln, Liverpool, Newcastle, Cambridge, Hull, and Plymouth; and
- not already running an intensive science mentoring or tutoring programme for Year 11 pupils at the time of programme delivery.

Mentors had to meet the following eligibility criteria to take part:

- be in their second or third year of undergraduate study (or fourth year if on a four-year programme) during the academic year of mentoring sessions (2023/2024). Alternatively, they could be in their first year of postgraduate study having just completed a science-related undergraduate degree;
- be studying for a degree in a science-related subject that confers a BSc degree, integrated master's degree, BEng / MEng, BPhys / MPhys, or MChem;
- have a minimum of a grade 4 (or C in the previous grading scale) in GCSE English, maths, and science (or equivalent in the context of the UK GCSE system);
- have a minimum of one A level in either biology, chemistry, physics, or psychology at grade C or higher (or equivalent, for example, BTEC or International Baccalaureate equivalent—including experience of the UK system); and
- be able to obtain enhanced Disclosure and Barring Service (DBS) checks prior to the commencement of mentoring (paid for by their university).

Mentees had to meet the following criteria:

- be in Year 11 during the academic year of mentoring sessions (2023/2024);
- be eligible for Pupil Premium;
- have a predicted grade 3 to 5 in GCSE science (as assessed by their teacher); and
- be studying combined 'double award' or 'combination' science (foundation or higher).

What: Materials and procedures

Recruitment of mentors, schools, and mentees

University partners were responsible for recruiting mentors from their cohort of eligible undergraduate students.[10] University partners invited students to take part in the programme via an invitation letter sent to a selection of STEM undergraduates in their first or second year of study (or third year if on a four-year integrated master's programme) in Spring Term 2023. Additionally, the opportunity was circulated through advertisements on the university website, as well as through announcements during lectures and seminars. Undergraduates were able to express interest in the programme by emailing their ASCENTS university partner or by applying through their university's student job portal.

Before being admitted to the programme, university partners verified that mentors met the eligibility criteria. Each prospective mentor then went through an enhanced DBS clearance check, which was paid for by their university. Places on the programme were allocated on a first-come first-served basis. Mentors were required to review and sign a Memorandum of Understanding (MoU), committing to their role as a mentor and to participating in the evaluation. The MoU was completed online and included providing contact details and details about the programme they were studying. University partners shared this information with NatCen via a secure website.

The University of Roehampton and the six partner universities also recruited schools in their local area,[11] through university outreach departments, and existing Initial Teacher Training programmes. Recruitment approaches included utilising school contacts, conducting local marketing campaigns (through emails and social media) and face-to-face visits with heads of science and members of the school senior leadership teams (SLTs). Schools applied to take part in the programme by contacting their local ASCENTS university partner, and subject to fulfilling the school eligibility criteria, were asked to sign an MoU committing to the programme and to participating in the evaluation. Schools sent signed MoUs to NatCen via email. Once schools committed to participating in ASCENTS, they selected a school lead, usually a science teacher, who was the main point of contact for their partner university and NatCen during the trial.

Staff in participating schools identified eligible pupils, based on the criteria listed above, and sent letters to them and their parents/carers inviting them to take part. These letters contained information about the programme delivery and the evaluation, including details about randomisation to intervention and control groups. Parents/carers were asked to give permission for their child to participate in the programme and the evaluation via a permission form. Once permission forms were returned to schools, school leads compiled a list of pupils and sent it alongside the data required to enumerate pupils to the trial to NatCen via a secure website. Pupils were then randomised into intervention and control groups.

Mentor–mentee pairing

After randomisation, university partners were responsible for pairing undergraduate students with Year 11 pupils. The university partners used the undergraduate timetable to align mentor availability with schools and then randomly paired them with pupils. There were some exceptional cases where a school lead felt that mentees and mentors should be the same gender for religious reasons. Once the pairings had been allocated, university partners informed mentors of their allocated schools and the details of their first mentoring session. The mentor–mentee pairs were intended to be the same throughout the programme, unless extenuating circumstances required pairs to be changed (e.g. a mentor drops out of the programme or due to mentor illness requiring temporary cover).

Mentor training and support

Mentors were required to attend a two-day training course held at their university before mentoring sessions began. The expectation was that the first day of training focused on procedural aspects, such as safeguarding. The second day of the training focused on mentoring practice, Pupil Premium context, and GCSE/subject matter.

[10] Some university partners recruited from partner institution and/or other universities in their local area, to help boost mentor recruitment.
[11] Plymouth Marjon University expanded its recruitment beyond the local area to recruit schools.

Mentors were also expected to attend a brief (one to two hours) additional procedural training session at their allocated school. This session focused on school-specific safeguarding procedures and was delivered by the headteacher or safeguarding lead within the school.

As part of the procedural training, or soon thereafter, schools could also provide mentors with GCSE textbooks and other-related materials (e.g. syllabus) to further support the delivery of the mentoring sessions.

To support ongoing delivery, it was expected that all mentors had one meeting per term with their ASCENTS university partner. The purpose of these meetings was to ensure sessions are delivered as planned and to help mentors resolve any school-related issues (e.g. still awaiting a science GCSE textbook from the school).

Delivery of mentoring sessions

The expectation was that mentees would receive 23 weekly one-hour face-to-face ASCENTS sessions throughout Year 11. Due to delays in recruitment, particularly with schools, the compliance measure for mentoring sessions was reduced from 23 sessions to 20 sessions. Compliance was measured continuously based on total mentoring exposure. Pupils received 1 point for each mentoring session attended. The score was then rescaled to a 0–1 scale.

Mentees were to decide the topics for each session. While teacher input was to be minimal, there were opportunities for the teacher to suggest work to be covered. The topics chosen needed to be part of the GCSE science curriculum. All sessions had to be desk-based and not include practical components, such as lab work.

Mentors were not required to prepare or make resources available to mentees; however, they could choose to prepare work based on the topics their mentee was studying. Mentors had to follow safeguarding procedures, and no contact was to be made between the mentor and mentee outside of the sessions. Mentors were paid for two hours per mentoring session by their university to cover expected preparation time, travel to and from schools, session delivery, and follow-up work.

Revision Day for mentees

The intention for Revision Days was that they would all be delivered at the universities after all (20 sessions or 23 sessions) mentoring sessions had been delivered and before the exam period. Schools were responsible for transportation costs and pupils had to be accompanied by a teacher, whose time had to be backfilled.

An adapted Revision Day could take place at school in the form of a three-hour revision session if the partner university chose not to host a Revision Day at their school or if schools decided that they did not want to take part in the university-hosted Revision Day (e.g. due to the cost of transport to the university).

The core component of the revision session was three hours of mentee-led revision, including one-hour each of revision in biology, chemistry, and physics. Additional activities for the remaining three hours of the Revision Day at universities were determined by the university. This was considered flexible and could have included: arranging a visit to a STEM department; arranging for a presentation from a school liaison team; and arranging breakfast and/or lunch.

The Revision Days did not go ahead as intended. Barriers to implementing the Revision Days and adaptations made to this programme element are presented in the 'IPE results' section below.

Travel fund

ASCENTS included a discretionary travel fund, managed by the university partners, to cover mentors' travel expenses. Mentors were able to claim reimbursement for travel on production of receipts.

How: Mode of delivery

ASCENTS mentoring was to be delivered in-person.

Training was also intended to be delivered in-person.

How much and when: Dosage

The expectation was that mentees would receive 23 weekly one-hour face-to-face ASCENTS sessions throughout Year 11. Due to delays in recruitment, the compliance measure for this intervention element was reduced from 23 sessions to 20 sessions.

Developers recommended that mentoring should take place outside of school hours, such as before or after school, but not during the Year 11 pupils' lunchtime.

Where: Location

The sessions were to be held at the mentees' school under the supervision of a qualified teacher, usually the school lead. All mentor–mentee pairs held the sessions in the same room. Developers specified that the mentoring sessions should take place in a classroom or science lab spacious enough for all mentors and mentees to fit in and to be adequately spaced apart.

Tailoring

The ASCENTS programme had several core components, which were expected to be consistent across participating schools. Examples include: the number of sessions (20 to 23); length of sessions (one hour); day and time of sessions (same day and time each week); consistent mentor–mentee pairing; and a revision session in the weeks leading up to GCSE exams. The delivery model encouraged tailoring in the following ways:

- Sessions were mentee-led and naturally differed depending on pupils' knowledge gaps in content.
- In terms of materials, mentors could be given GCSE textbooks and other-related materials (e.g. syllabus) by participating schools, so the mentors had the same/similar materials as their mentees. This was not a requirement, however.
- Mentors were not required to prepare or make resources available to mentees, however, they sometimes may have chosen to prepare work based on the topics they knew their mentee was studying.
- There was no official requirement for school leads to brief the mentors after the initial training sessions but the teacher in the room could speak with mentors before or after the session.
- Mentees could work in a three-group session with another mentor–mentee pair if a mentor was absent.
- Schools could have gender preferences in pairing mentor with mentee (e.g. for religious reasons).
- Hourly pay rates were set independently by each university partner and could vary between each university.
- The Revision Day structure and content could vary outside of the three hours of GCSE content (one hour each of biology, chemistry, and physics). The location could also vary depending on the university's willingness and ability to host the session and/or the schools' willingness and ability to attend (e.g. due to travel costs).

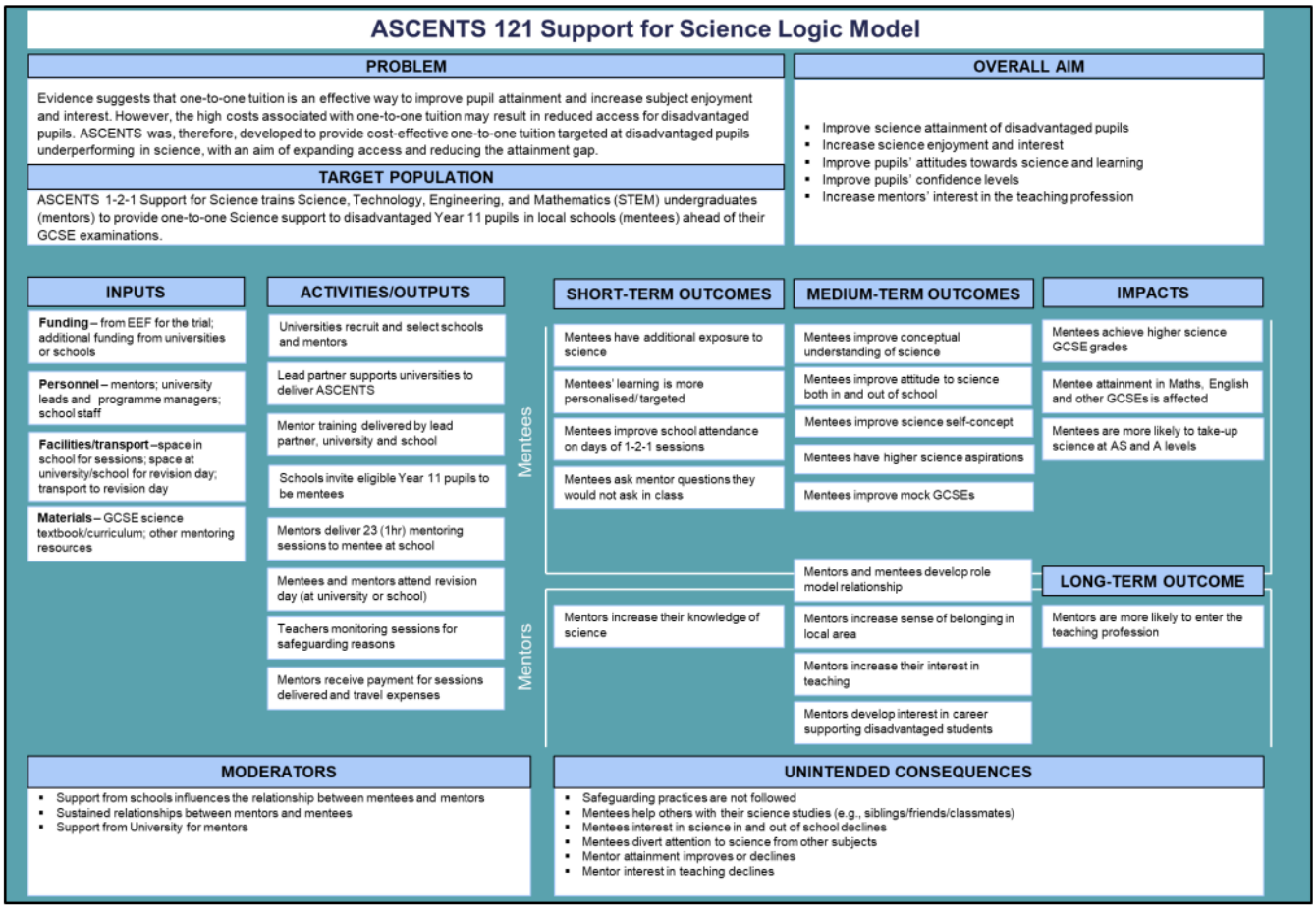
Intervention logic model

The evaluation team updated the ASCENTS logic model from the version used in the previous trial in consultation with the developer and the EEF. Changes take learning from the IPE of the previous ASCENTS trial into account.

The logic model (Figure 1) outlines the sequence of activities implemented by the developer, university partners, and schools. It sets out the intended impacts of the programme for mentees and mentors, and the short- and medium-term outcomes that contribute to these impacts. There were no underlying assumptions stated in the logic model or evaluation protocol.

No modifications were made to the logic model during the trial. In the 'Conclusion' section below, we recommend revisions to the logic model based on the results of this trial.

Figure 1: ASCENTS 1-2-1 Support for Science logic model



Evaluation objectives

The objectives for this efficacy trial were to evaluate the impact and implementation of ASCENTS and consider the intervention's readiness to progress to an effectiveness trial on the EEF pipeline. Table 3 presents the evaluation research questions.

Table 3: ASCENTS Evaluation research questions

Evaluation dimension	Research question
Primary outcome	1. What is the impact of ASCENTS on the science GCSE attainment of disadvantaged Year 11 pupils in England?
Secondary outcomes	2. What is the impact of ASCENTS on the maths GCSE attainment of disadvantaged Year 11 pupils in England? 3. What is the impact of ASCENTS on the English GCSE attainment of disadvantaged Year 11 pupils in England? 4. What proportion of ASCENTS mentees go on to enroll on a science A level?
Implementation fidelity	IPE RQ1. Was ASCENTS implemented as planned by universities, schools, and mentors? IPE RQ2. What were the drivers and obstacles to implementation?
Dosage	IPE RQ3. How many sessions did mentors attend/pupils receive? IPE RQ4. What was the amount of time spent delivering the sessions?
Reach	IPE RQ5. Did the intervention reach its intended population? IPE RQ6. Are there patterns in terms of pupil characteristics?
Mentors' responsiveness	IPE RQ7. How engaged were mentors with the processes of preparations, delivery, and follow-ups? IPE RQ8. How did mentors feel about the programme? IPE RQ9. What were the perceived costs and benefits of being an ASCENTS mentor? IPE RQ10. What were the drivers/obstacles to mentors' engagement?
Mentees' responsiveness	IPE RQ11. How engaged were mentees in preparing for, attending and following up on mentoring sessions? IPE RQ12. What were the perceived costs and benefits of participating in ASCENTS? What did mentees learn?

Evaluation dimension	Research question
	IPE RQ13. How did mentees feel about mentoring sessions? IPE RQ14. What were the drivers/obstacles to mentees' engagement?
Differentiation	IPE RQ15. What is usual practice and how does ASCENTS differ? IPE RQ16. To what extent does ASCENTS differ from the NTP?
Contamination	IPE RQ17. Did ASCENTS mentees share learning from the programme with their peers who did not receive the intervention?
Context	IPE RQ18. What factors influenced the delivery or impact of ASCENTS?[a]
Wider outcomes	IPE RQ19. What is the perceived effect of ASCENTS mentoring programme on classroom dynamics? IPE RQ20. What are the perceived effects on schools and teachers? IPE RQ21. How did ASCENTS influence mentors' choices about further study and/or career plans? IPE RQ22. What are the drivers and obstacles to positive outcomes? IPE RQ23. Is ASCENTS attractive for universities and schools to take-up and deliver?
Cost	IPE RQ24. What are the per-pupil costs of delivering ASCENTS?

[a] *The protocol asked two questions about the NTP within the dimension of context. These questions were dropped from the evaluation because only a small number of schools and a smaller number of pupils were taking part in NTP during the trial period. The intersection between the NTP and ASCENTS is explored as a contextual factor as well as usual practice.*

The trial protocol was published in August 2023, and the Statistical Analysis Plan (SAP) was first published in May 2024 and then updated in April 2025. Both can be found on the ASCENTS 121 Support for Science – second trial project page[12] on the EEF's website.

Ethics and trial registration

Ethics

NatCen's Research and Ethics Committee (REC) reviewed and approved the research proposal for this project on 20 January 2023. The committee consists primarily of senior NatCen staff and provides guidance and recommendations to ensure projects are conducted to the highest ethical standards. The guidance and recommendations provided by the REC were incorporated into the protocol.

Procedures for obtaining agreement to participate in the trial

Mentor recruitment

University partners identified and recruited mentors, with NatCen communicating the requirements for research participation. Mentors were given a study information letter, a link to the NatCen project webpage, and were asked to sign an MoU to express consent to take part in the evaluation (Appendix G). Full names and personal email addresses of participating mentors (with institutional addresses provided as an alternative) were transferred to NatCen securely.

School recruitment

University partners identified and recruited eligible schools, with NatCen advising on eligibility criteria and communicating the requirements for research participation. Schools were provided with a study information letter, a link to the NatCen project webpage, and were asked to sign an MoU to express consent to take part in the evaluation. Contact details of participating schools' leads were transferred to NatCen securely.

Pupil recruitment

NatCen provided schools with two study information letters: one for eligible pupils; and one for their parents/carers. These letters detailed all aspects of the intervention and evaluation, the voluntary nature of participation, and the management of confidentiality and anonymity. They also explained that pupil data would be linked to the NPD in order to obtain baseline and outcome attainment data for the impact evaluation, including the planned longitudinal analysis. A link to the NatCen

[12] See: https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/ascents-121-support-for-science-2023-24-trial

project webpage was provided for further information. Details (name, unique pupil identifier, date of birth) of pupils whose parents/carers gave permission to take part in the intervention were transferred to NatCen via a secure webpage.

Pupils (or their parents/carers if they were under the age of 16) had the opportunity to object to their data being processed as part of the evaluation at any point after data collection and until a draft report was submitted to the EEF. Where consent for data processing was withdrawn, pupil data were not linked to the NPD. Pupil and parent/carer information sheets also provided information about how to raise concerns with the Information Commissioner's Office.

Registration

The trial is registered on the Open Science Framework (OSF). The registration link is: **https://osf.io/ek34a**

More details are available on the ISRCTN (International Standard Randomised Controlled Trial Number) website: **https://doi.org/10.1186/ISRCTN28630907**

Data protection

The EEF funded NatCen to carry out the independent evaluation of ASCENTS.

During the study, NatCen was the data controller for this project. After the evaluation report with the longitudinal follow-up analysis is published, data from the impact evaluation will be stored in the EEF archive. At this point, the EEF will become the data controller. Personal identifiers were removed and replaced by a meaningless identifier (so-called Pupil Matching Reference, 'PMR') and uploaded to the Secure Research Service (SRS) hosted by the Office for National Statistics (ONS). The resultant dataset cannot be used to identify any individual pupil in the SRS.

For the use of personal data to be lawful, one (or more) conditions must be met, as set out in Article 6(1) of the General Data Protection Regulation (GDPR) (GDPR, 2016).

Personal data

The legal basis for processing personal data was covered by GDPR Article 6 (1) (f):

> Legitimate interests: the processing is necessary for your (or a third party's) legitimate interests unless there is a good reason to protect the individual's personal data which overrides those legitimate interests. (GDPR, 2016)

NatCen's assessment was that the evaluation fulfils one of its core business purposes (undertaking research, evaluation, and information activities) and was therefore, in its legitimate interest, that processing personal information is necessary for addressing the research questions in this study. NatCen considered and balanced any potential impact on the data subjects' rights and found that its activities would not do the data subject any unwarranted harm.

Data processing

NatCen provided an MoU to participating schools and mentors explaining the nature of the data being requested, how it would be collected, and how it would be passed to and shared between partner universities to NatCen (Appendix H and Appendix G). Procedures for ensuring data quality, anonymity, and confidentiality can be found in the **privacy notice.**[13]

The evaluation necessitated the use of NPD data for baseline and endline measures of the outcomes of interest. NatCen accessed the NPD data extracts through the SRS at the ONS. Analysis was undertaken in Stata v17 (StataCorp LLC, College Station, Texas, USA) with steps recorded using do and log files.

The data was then shared with DfE, in order to be linked to the NPD. The data will also be shared with the commissioner of the evaluation (the EEF) and an organisation known as FFT, which processes data on behalf of the EEF to be archived on the

[13] See: https://natcen.ac.uk/privacy-notice-evaluation-ascents-1-2-1-support-science-retrial

SRS at the ONS. It will also be stored in the EEF archive (also managed by FFT) where other research teams can access it. After archiving the data on the SRS at the ONS, the data will be potentially shared with other parties, relinked to the NPD, and linked to other datasets.

Finally, NatCen, University of Roehampton and collaborating universities will delete all personal information, and any other data held on the project, within six months from report publication. For the main ASCENTS evaluation this will be 2027.

Project team

Delivery team

ASCENTS was delivered by a team of university partners led by Professor Ian Abrahams at University of Roehampton. The university partners were responsible for recruiting mentors and schools, allocating mentors to mentees, providing training and ongoing support to the mentors, and co-ordinating the delivery of the programme.

- Professor Ian Abrahams, the University of Roehampton: Overall programme lead.
- Dr Melissa Jogie, the University of Roehampton: University programme lead.
- Professor Marie-Pierre Moreau, Anglia Ruskin University: University programme lead.
- Professor Mark Lorch, the University of Hull: University programme lead.
- Dr Anita Backhouse, the University of Lincoln: University programme lead.
- Dr Andrew Low, the University of Liverpool: University programme lead.
- Professor Martin Tovee, Northumbria University: University programme lead.
- Professor Tanya Oveden-Hope, Plymouth Marjon University: University programme lead.

Evaluation team

The evaluation was conducted by evaluation specialists with substantive expertise in education at NatCen. The evaluation was led by NatCen's Centre for Children and Families, who worked closely with impact evaluation experts in NatCen's Centre for Evaluation.

Table 14: Evaluation team

Names	Project role	Job title
Mary McKaskill	Principal investigator, IPE lead	Research director
Dr Enes Duysak	Impact evaluation lead	Research director
Alina Fletcher	Day-to-day project management until June 2024	Senior researcher
Rebecca Parker	Impact evaluation analysis and support	Senior researcher
Charlotte Tomlinson	IPE project support	Researcher
Alina Haque	Impact evaluation and IPE project support	Research assistant
Makenzie Uglow	Principal investigator and IPE lead until January 2024	Research director
Dr Terry Ng-Knight	Impact evaluation lead until August 2024	Research director

The project benefited from senior oversight from Dr Gayle Munro, Director of the Centre for Children and Families; Dr Andi Fugard, former co-director of the Centre for Evaluation (until August 2024); and Dr Tina Haux former director of the Centre for Children and Families (until August 2023).

Methods

Trial design

This evaluation was a two-arm, multi-site efficacy RCT to evaluate the impact of the ASCENTS mentoring programme on the academic outcomes of Year 11 pupils from disadvantaged backgrounds. As an efficacy trial, the evaluation aimed to test the effect of the intervention under controlled conditions to establish a clear causal relationship. The unit of randomisation was the individual pupil, and the trial consisted of two arms: the ASCENTS mentoring group (referred to as the intervention group); and the control group. This means that pupils at the same school could have been randomised into either intervention or control group.

Pupils in the ASCENTS mentoring group received one-on-one mentoring sessions from STEM undergraduates, while pupils in the control group continued with their usual science education practices. The ASCENTS mentoring sessions were designed to provide intensive, individualised support to help pupils improve their science attainment ahead of their GCSE examinations. The control condition was 'business as usual', meaning that pupils in the control group continued to receive the standard science education provided by their schools without any additional intensive mentoring support. No financial incentives were provided to either intervention or control pupils for participation in the trial.

Table 5: Trial design

Trial design, including number of arms		Two-arm, multi-site trial with randomisation at the individual level
Unit of randomization		Individual[a]
Stratification variable (s) (if applicable)		School
Primary outcome	Variable	Science GCSE attainment
	Measure (instrument, scale, source)	Grade achieved in full GCSE double award science, NPD variable: KS4_APCOMBSCI_91
Secondary outcome(s)	Variable(s)	Maths GCSE attainment English GCSE attainment Progression to science A level or AS level
	Measure(s) (instrument, scale, source)	1. Highest grade achieved in full GCSE maths. KS4_APMAT_91 2. Highest grade achieved in full GCSE English. KS4_APENG_91 3. Grade achieved for A level or AS level biology, chemistry, or physics (used to indicate progression to science A level or AS level)
Baseline for primary outcome	Variable	Teacher-assessed science attainment at Key Stage 2
	Measure (instrument, scale, source)	KS2_SCITAOUTCOME
Baseline for secondary outcome(s)	Variable	1. Key Stage 2 maths attainment 2. Key Stage 2 reading attainment 3. Key Stage 2 science attainment
	Measure (instrument, scale, source)	1. KS2_MATMRK 2. KS2_READMRK 3. KS2_SCITAOUTCOME[b]

[a] *Findings from the IPE of the 2019/2020 trial found there was limited contamination from peers receiving the programme to those who were not. This result is assumed to hold true for the current trial, so no adjustments were made to the impact evaluation. Nevertheless, the IPE explored the potential for spillover and contamination effects.*
[b] *As with the baseline measure for the primary outcome, Key Stage 2 science attainment will be used for the secondary analysis of the progression to science A Level. The Key Stage 2 data is available for most pupils so will be the best predictor of the three options considered at the protocol stage (Key Stage 2 science, Key Stage 2 maths, and Key Stage 2 reading).*

The outcome measures selected for the trial were based on their relevance to the programme's objectives and their ability to capture the intended effects. The primary outcome of the trial was the attainment of pupils in the GCSE combined science (double award), measured using the NPD variable KS4_APCOMBSCI_91. Secondary outcomes included maths GCSE attainment (KS4_APMAT_91), English GCSE attainment (KS4_APENG_91), and progression to science A level or AS

level. These outcomes were chosen to capture both the direct impact of the ASCENTS programme on science attainment and its broader academic effects. More details are provided in the 'Baseline and outcome measures' section below. Table 5 above presents the overall trial design.

Changes were made to the original trial design. Initially, the programme was intended to deliver 23 mentoring sessions; however, this number was reduced to 20 mentoring sessions due to delays in starting the programme and to align with school and university exam timetables. These changes were made to ensure the feasibility and integrity of the trial while maintaining the validity of the evaluation. In addition, although the protocol specified stratification by school and pupils' receipt of NTP support, limitations in available NTP data meant that randomisation was stratified by school only. Further details are provided in the 'Randomisation' section below.

Participant selection

We defined the trial population as all pupils meeting the intervention eligibility criteria,[14] had permission to participate and had not withdrawn from data processing. This comprised 839 pupils across 64 schools who were randomised into the trial. Further details are provided in the 'Sample size' section and the **'**Participant flow including losses and exclusions' section.

Schools confirmed their participation in the trial by signing MoUs. After schools had signed MoUs, universities sent schools the following materials to pass on to eligible pupils and their parents/carers:

- a parent/carer letter requesting permission for their child to take part in the ASCENTS programme;
- a pupil information letter; and
- a privacy notice.

Parents/carers were given two weeks to opt out of the trial and from data processing. After this period, schools were asked to share with NatCen pupil-level information for all pupils who had not been formally withdrawn from the trial. Pupils were informed that they could withdraw their consent at any time and would not be penalised for doing so.

Once schools had identified pupils who met the eligibility criteria and obtained permission for them to take part, they were asked to share pupil details (name, surname, date of birth, Unique Pupil Number, Unique School Number, gender, predicted science grade, form group, pupils' receipt of NTP, if available, and Pupil Premium status). This pupil information was collected in an Excel spreadsheet template and uploaded by schools using a secure portal on the NatCen website. This data allowed NatCen to match the details of pupils allocated to both the ASCENTS mentoring group and the control group with the relevant NPD outcome data.

Baseline and outcome measures

Baseline measures

The baseline measures for this trial were derived from the NPD and included teacher-assessed attainment at Key Stage 2 in science, and Key Stage 2 SATs test scores in maths and reading. We used these measures to account for pupils' prior attainment.

Key Stage 2 science attainment represented pupils' understanding and knowledge of science concepts at the end of primary education. This measure aligned with the logic model by providing a baseline to assess the impact of the ASCENTS programme on subsequent science attainment. Key Stage 2 science attainment was a teacher-assessed measure recorded in the NPD (variable: KS2_SCITAOUTCOME) and was a binary indicator of whether the pupil met the expected standard.

The protocol stated that different options for baseline measures would be explored, including Key Stage 2 maths and reading attainment. This was because Key Stage 2 science attainment is teacher assessed, may be subject to bias, and is

[14] Further details on participant eligibility are provided in the 'Intervention' section above.

not mandatory for teachers to complete. Following completion of the protocol, the DfE confirmed that Key Stage 2 science attainment data were available for most pupils (with less than 0.5% missing). We, therefore, decided that this was the most appropriate measure to use as the baseline for the primary outcome. Sensitivity analyses were also conducted in which Key Stage 2 maths and reading attainment were included individually as baseline measures in the primary outcome model.

Key Stage 2 maths attainment (NPD variable: KS2_MATMRK) reflected pupils' numeracy skills at the end of primary education and was used as a baseline for evaluating the impact of the ASCENTS programme on GCSE maths attainment. This measure was derived from pupils' raw total marks across three Key Stage 2 maths tests, with a maximum obtainable score of 110.[15]

Key Stage 2 reading attainment (NPD variable: KS2_READMRK) reflected pupils' literacy skills and was used as a baseline for evaluating the impact of the programme on English GCSE attainment. This measure was based on pupils' raw marks on a reading test, with a maximum obtainable score of 50.

Primary outcome

The primary outcome was pupils' attainment in GCSE combined science (double award). This outcome aligned with the logic model by directly assessing the effectiveness of the ASCENTS programme in improving science education outcomes for pupils from disadvantaged backgrounds. The primary outcome was derived from the NPD (variable: KS4_APCOMBSCI_91), which records one of 17 possible combinations of two identical or adjacent grades across biology, chemistry, and physics.[16] These two grades were averaged to produce a single continuous GCSE science grade (e.g. a pupil achieving a 5–4 would be assigned a grade of 4.5).

Secondary outcomes

The secondary outcomes included measures of GCSE maths attainment, GCSE English attainment, and progression to science A level or AS level.

GCSE maths and English attainment were included in the logic model as additional secondary outcomes, reflecting potential wider academic impacts of the ASCENTS programme; however, these were not intended to be proximal outcomes of the intervention. GCSE maths attainment aligned with the logic model by evaluating the broader academic impact of the ASCENTS programme beyond science. The measure was taken from the NPD (variable: KS4_APMAT_91) and represented the highest grade achieved in GCSE maths, scored on a 1–9 scale, with grade 9 representing the highest grade. GCSE English attainment was also used to assess whether the ASCENTS programme had wider academic effects beyond science. The measure was taken from the NPD (variable: KS4_APENG_91) and represented the highest grade achieved in GCSE English, scored on the same 1–9 grading scale as GCSE maths.

Progression to A level or AS level science was specified in the evaluation protocol as a secondary outcome; however, findings for this outcome are not included in this report. NatCen will collect information in 2026 on whether pupils progressed to A level or AS level science (biology, chemistry, or physics), two years after collection of GCSE attainment data. A binary variable will be created to indicate whether pupils sat an A level or AS level science exam, which will act as a proxy for progression to science at A level. This measure will be based on NPD-derived A level or AS level attainment grades in the three science subjects. Any outcome indicating that a pupil was graded or ungraded (A–E and N, Q, U, or X) will be classified as 'progression to A level or AS level science', while not enrolling in a science A level or AS level will be classified as 'did not progress'. Findings will be presented in a separate addendum once the data becomes available in 2026.

[15] The Key Stage 2 mathematics tests include one arithmetic paper (40 marks) and two reasoning papers (35 marks each), giving a maximum total of 110 marks.

[16] Identical or adjacent grades ranging from: 1–1; 2–1; 2–2 to 8–8; 9–8; and 9–9. Pupils cannot get any other combinations of two grades, such as 6–3 or 8–1. Pupils can also be entered for either the foundation tier paper (which allows a pupil to achieve grades 1–1 through 5–5) or the higher tier paper (which allows a pupil to achieve grades 4–4 through 9–9).

Sample size

At the protocol stage, we aimed for the university partners to recruit 55 secondary schools, with an average of 17 pupils per school.[17] This would yield a total sample of 922 pupils, randomly allocated in equal numbers to the ASCENTS and control groups. We made a conservative assumption of a moderate pupil-level correlation between baseline and endline ($r = 0.55$). A Type I error rate of 0.05 and a Type II error rate of 0.20 (power of 0.80) were used. The planned recruitment of 55 secondary schools (n=922 pupils) would yield a minimum detectable effect size (MDES) of 0.15 SDs for the primary analysis of GCSE science attainment. Details are covered in the trial protocol under the 'Sample size' section.[18] We conducted this and subsequent power calculations using the *PowerUp!* tool (Dong and Maynard, 2013).

At the randomisation stage, we updated the power calculations using the actual number of schools (n=64 schools) and pupils (n=877 pupils) recruited for the trial. The calculations used the actual data at that time and were based on the same core assumptions as the protocol stage. With these updated sample sizes, the overall MDES for the primary analysis was 0.16 SDs.

At the analysis stage, we again updated the power calculations using the final number of schools (n=57) and pupils (n=690) included in the primary analysis. We also used the updated pupil-level correlation between Key Stage 2 science attainment (baseline) and GCSE science attainment (endline) (r = 0.34). With these updated figures, the overall MDES at endline is 0.20 SDs for the primary analysis. This was higher than the maximum attrition MDES projected at the SAP writing stage (0.183), reflecting the lower-than-assumed baseline-endline correlation observed. As a result, baseline adjustment contributed less to precision than originally expected, despite slightly lower levels of attrition.

Table 6 presents our sample size calculations from the protocol stage to randomisation, and to analysis.[19]

Table 6: MDES calculations at different stages

		Protocol	Randomisation	Analysis
		Overall	Overall	Overall
MDES		0.15	0.16	0.20
Pre-/post-test correlations	Level 1 (pupil)	0.55	0.55	0.34
Intracluster correlation coefficients (ICCs)	Level 2 (school)	N/A	N/A	N/A
Alpha		0.05	0.05	0.05
Power		0.8	0.8	0.8
One-sided or two-sided?		Two-sided	Two-sided	Two-sided
Average cluster size		16.76	13.08	12.10
No. of schools	Intervention	55	64	57
	Control	55	64	57
	Total:	55	64	57
No. of pupils	Intervention	461	419[a]	340

[17] The number of schools and pupils was determined partly by logistical considerations, including universities' capacity to recruit schools and mentors.
[18] 'ASCENTS re-trial evaluation protocol'. Available at: https://d2tic4wvo1iusb.cloudfront.net/production/documents/projects/ASCENTS_re-trial_protocol_18082023-final.pdf?v=1765248729
[19] One of the eligibility criteria for the trial was that pupils were eligible for Pupil Premium, additional funding provided to state-funded schools in England with the aim to improve outcomes for pupils from disadvantaged backgrounds. Schools qualify for Pupil Premium funding for every pupil who has either been eligible for FSM any time in the last six years, is a looked after or formerly looked after child, or is from an armed services family. Due to a large overlap between those currently eligible for FSM and those eligible for Pupil Premium, we did not carry out additional power calculations for pupils eligible for FSM.

	Control	461	420	350
	Total:	922	839	690

[a] *Power calculations at the randomisation stage, as reported in the SAP, excluded two pupils who were randomly designated as 'reserve' pupils after NatCen was notified that one school did not have enough mentors to cover all pupils allocated to the intervention group. These pupils were therefore, not included in the intervention group sample size at the randomisation stage. Following randomisation, NatCen was informed by other university partners that additional pupils could not be matched with mentors and were placed on reserve lists. It was subsequently agreed that these pupils would remain in the intervention study sample and be included in the intention-to-treat (ITT) analysis, with programme participation reflected in mentoring attendance data. As a result, the intervention group size reported here (n=419) differs slightly from the number assumed in the SAP (n=417).*
N/A=not applicable.

Randomisation

Randomisation was carried out at the pupil level within each participating school, ensuring that pupils were randomly allocated to either the ASCENTS mentoring group or the control group. Following the protocol, stratified randomisation by school was employed to promote balance between trial arms at the setting level, enhance comparability between groups, and account for potential variations in school characteristics and programme implementation.

While the protocol specified that randomisation would be stratified by school and, where available, by pupils' receipt of NTP support, NTP data was not sufficiently complete to enable this. For pupils randomised, approximately 3.7% of pupils were confirmed by teachers as being in receipt of NTP support. Given the small proportion, stratification by NTP receipt was not implemented, and randomisation was therefore stratified by school only.

By October 2023, 64 schools and 877 pupils had been recruited to the trial. Each participating school securely shared pupil data with NatCen for pupils who were eligible and whose parents/carers had provided consent to take part. NatCen conducted randomisation using the *randtreat* command in Stata 17.[20] The analyst who carried out the randomisation was blinded to pupil identity, and all steps were documented for monitoring and replication.[21]

Following the process set out at the protocol stage, we randomised twice as many pupils as the number of mentors assigned within each school, ensuring a 50:50 allocation between the intervention and control groups. Where a school had more than twice as many eligible pupils as available mentors, additional pupils were randomly excluded prior to randomisation. As a result, 38 pupils were excluded from the study. Of the remaining 839 pupils, 419 were allocated to receive ASCENTS mentoring and 420 were allocated to the control group.

Statistical analysis

The impact evaluation analysis was conducted in the ONS SRS,[22] with analysis undertaken using Stata v17. The outcome analysis was undertaken on an ITT approach, with pupils analysed as per their intended allocation to either the ASCENTS mentoring group or the control group. This ensured that all pupils were analysed in the groups to which they were originally assigned, regardless of their level of participation or any deviations from the planned intervention.

Primary analysis

The primary outcome analysis addressed the primary research question:

1. What is the impact of ASCENTS on the science GCSE attainment of disadvantaged Year 11 pupils in England?

The primary outcome analysis used an ITT approach to estimate the impact of ASCENTS on pupils' science GCSE attainment. 'Conditional inference' was drawn from this evaluation design. This type of inference was appropriate as the study was an efficacy trial, and the findings are not to be generalised beyond the sample of schools included in the trial.

[20] Stata is a statistical software package for data management and quantitative analysis.
[21] NatCen analysts did not conduct the analysis blind to randomisation; however, they did not have access to pupil or school names and worked only with pseudonymised identifiers.
[22] Work undertaken in the ONS SRS does not imply the endorsement of the ONS or other data owners.

A fixed-effects model was used to estimate the conditional inference. Effects were estimated using a single-level ordinary least squares (OLS) regression model including the following variables:

- Baseline measure of Key Stage 2 science attainment.
- A binary variable indicating allocation to the ASCENTS mentoring group (=1) or control group (= 0).
- A set of binary variables representing the schools.

In all models, robust standard errors were used to adjust for heteroskedasticity, applying the vce(robust) option in Stata v17. The basic form of the fixed effect model is:

$$(1)\ Science\ attainment_{ij} = \beta_0 + \beta_1 KS2Science_{ij} + \beta_2 intervention_{ij} + school_j + \varepsilon_{ij},$$

where pupil (i) attends school (j):

- β_0 is an overall intercept;
- β_1 is a fixed gradient between the Key Stage 2 science attainment and Key Stage 4 science attainment;
- β_2 is the average effect of the programme on Key Stage 4 science attainment; and
- ε_{ij}, is the error term.

The impact of the programme on GCSE science attainment is expressed as a standardised effect size. Details of the calculation are provided in the 'Estimation of effect sizes' section below.

Secondary analysis

For both secondary outcome analyses, we followed the same method as the primary outcome analysis, using an ITT approach and a single-level OLS model. Models included a baseline measure the respective attainment, a binary variable indicating allocation to the ASCENTS or control group and a set of binary variables representing fixed effects at school level. Robust standards errors were used to adjust for heteroskedasticity and the analyses were implemented in Stata v17.

The secondary outcome analysis explored the following research questions:

2. What is the impact of ASCENTS on the maths GCSE attainment of disadvantaged Year 11 pupils in England?

3. What is the impact of ASCENTS on the English GCSE attainment of disadvantaged Year 11 pupils in England**?**

The basic form of the model for research question 2 is:

$$(2)\ Maths\ attainment_{ij} = \beta_0 + \beta_1\ KS2maths_{ij} + \beta_2 intervention_{ij} + school_j + \varepsilon_{ij}$$

where pupil (i) attends school (j):

- β_0 is an overall intercept;
- β_1 is a fixed gradient between the Key Stage 2 maths attainment and Key Stage 4 maths attainment;
- β_2 is the average effect of the programme on KS4 maths attainment; and
- ε_{ij}, is the error term.

The basic form of the model for research question 3 is:

$$(3)\ English\ attainment_{ij} = \beta_0 + \beta_1 KS2english_{ij} + \beta_2 intervention_{ij} + school_j + \varepsilon_{ij}$$

where pupil (i) attends school (j):

- β_0 is an overall intercept;
- β_1 is a fixed gradient between the Key Stage 2 English attainment and Key Stage 4 English attainment;
- β_2 is the average effect of the programme on Key Stage 4 English attainment; and
- ε_{ij}, is the error term.

The impact of the programme on GCSE maths and English attainment is expressed as a standardised effect size. Details of the calculation are provided in the 'Estimation of effect sizes' section below.

Analysis in the presence of non-compliance

To account for potential non-compliance among pupils allocated to the ASCENTS mentoring group, we conducted a Complier Average Causal Effect (CACE) analysis. This approach estimates the effect of the intervention among those who complied with their treatment assignment.

Compliance was originally defined as attendance at up to 20 mentoring sessions and participation in a three-hour revision session (maximum score of 23 points). However, attendance data for the revision session were incomplete across schools, which would have substantially reduced the analysis sample. We therefore, excluded attendance at the three-hour revision session and defined compliance using mentoring attendance only, based on records submitted by schools. Each pupil was awarded 1 point per session attended, up to a maximum of 20 sessions, and this score was rescaled to a range of 0 to 1 to form a continuous measure of compliance.

The CACE[23] analysis was estimated using a two-stage least squares (2SLS) method (Angrist and Imbens, 1995) with allocation to ASCENTS as the instrumental variable for the compliance measure. The first stage of the instrumental variable estimation estimated whether assignment to the ASCENTS mentoring programme encouraged pupils to attend mentoring sessions. The model for the first stage regression was specified as follows:

$$\mathrm{Comply}_{ij} = \propto + \beta_1 \mathrm{KS2Science}_{ij} + \beta_2 Intervention_{ij} + \mathrm{school}_j + \varepsilon_{ij}$$

From the first stage analysis, we reported the 2SLS results alongside tests of endogeneity to assess whether allocation to ASCENTS allocation was suitable for instrumental variable estimation (Wooldridge, 1995) F-statistics and p-values were reported in line with the EEF guidance (EEF, 2022c).

In the second stage, the predicted values from the first stage equation, $\widehat{Comply}_{ij}$, were used in the estimation of the following model:

$$\mathrm{Y}_{ij} = \propto + \beta_1 \mathrm{KS2Science}_{ij} + \beta_2 \widehat{\mathrm{Comply}}_{ij} + \mathrm{school}_j + \omega_{ij}$$

The second stage of the instrumental variable estimation predicted the outcome (GCSE science attainment) by incorporating the compliance rate estimated in the first regression to the model used to estimate the primary outcome.

Missing data analysis

We followed the protocol for missing data suggested by the EEF (EEF, 2022). For missingness at a rate of 5% or less from randomisation to final analysis, a complete case analysis would have been employed. However, as the rate of missingness exceeded 5%, an assessment of missingness was carried out.

As a first step, we examined the extent of missing data in the outcome and pre-intervention covariates using descriptive cross-tabulations, reporting both counts and percentages across categories. We then explored patterns of missingness using a multilevel logistic regression dropout model, where missingness in the outcome was modelled in relation to pupil-level covariates (gender, FSM eligibility, and baseline science, maths, and reading attainment) and school-level

[23] Corresponding to the average effect of the intervention for those pupils who have complied with the programme.

characteristics. This approach allowed us to assess whether missingness was predicted by pupil- or school-level characteristics.

A second dropout model was estimated in which the dependent variable was whether the baseline measure used in the primary outcome analysis (Key Stage 2 science attainment) was missing. This model used the same pupil- and school-level covariates as the first dropout model, but additionally included GCSE science, English, and maths attainment. Both dropout models were estimated using the *melogit* command in Stata v17.

If data were missing in a way that was not correlated with other observed variables in the dataset, complete case analysis was used. If only the outcome variable in a substantive model was considered missing at random conditional on covariates, then the covariates were included in the model and results were compared to the model without covariates. If a covariate in the substantive model was considered missing at random conditional on other covariates, then multiple imputation was used for that covariate, and results were presented alongside headline impact estimates for comparison. Multiple imputation by chained equations (MICE) was implemented (using the mi suite of commands in Stata v17).

If missing data appeared to be missing not at random, multiple imputation was used as described earlier, in addition to some sensitivity analyses (Carpenter *et al.,* 2007). The results of the missing data analyses are presented in the 'Missing data analysis' section.

Subgroup analyses

Although the majority of pupils eligible for Pupil Premium are expected to receive FSM, we performed subgroup analysis with pupils eligible for FSM to allow comparison across the EEF's educational interventions. Following the EEF statistical guidance (EEF, 2022), for subgroup analysis, we used a variable identifying pupils who are known to have been eligible for FSM in the last six years (NPD variable: KS4_FSM6_P).

We first carried out subgroup analysis by FSM-eligibility status by re-running the primary outcome analysis on a sub-sample containing only pupils eligible for FSM in the last six years. Second, we carried out an alternative fixed-effects model for the primary outcome analysis, including an interaction term between treatment status and a dummy variable indicating FSM-eligibility status. The model included baseline Key Stage 2 science attainment and a set of binary variables representing fixed effects at school level as covariates.

The basic form of the model is:

$$(1)\quad Science\ attainment_{ij} = \beta_0 + \beta_1 \mathrm{KS2Science}_{ij} + \beta_2\ \mathrm{intervention}_{ij} + \beta_3 \mathrm{FSM}_{ij} + (\beta_4 \mathrm{intervention}_{ij}\ \mathrm{x}\ \mathrm{FSM}_{ij}) + \mathrm{school_j} + \varepsilon_{ij}$$

where pupil (i) attends school (j), β_4 is the attainment gap—the difference in the average effect of the programme between FSM pupils and their peers.

Following the EEF statistical analysis guidance (EEF, 2022), we reported two standardised effect sizes: one using the restricted sample of pupils eligible for FSM only; and another for the interaction term coefficient (β_4) using the unrestricted sample. The results from these two approaches were compared as a sensitivity check.

Additional analyses and robustness checks

Unlike Key Stage 2 science attainment, the baseline measures for Key Stage 2 maths and English attainment are continuous rather than binary. These continuous measures may therefore, provide more sensitive indicators of prior attainment. Furthermore, there are known variations in science attainment across gender and region.

We carried out additional analyses by re-estimating the primary outcome model in three separate models:

- Key Stage 2 maths attainment as an additional covariate;
- Key Stage 2 English attainment as an additional covariate; and
- indicators for pupil gender and school region.

Consistent with the primary outcome analysis, the results of all additional analyses were expressed as standardised effect sizes.

Imbalance at baseline

We examined potential imbalances at baseline to assess whether randomisation created comparable groups across key characteristics at both the pupil and school levels. This analysis focused on gender and Key Stage 2 attainment in science, maths, and English, as differences in these factors could influence GCSE science outcomes.

To assess potential imbalances, we used cross-tabulations and descriptive statistics. For categorical variables, such as gender and Key Stage 2 science attainment, we calculated counts and percentages for each group, treating differences of 5% or more as potential imbalances. For continuous variables, such as Key Stage 2 maths and reading attainment, we compared mean scores between groups and expressed differences as Hedges' g effect sizes, with an effect size of 0.05 or greater indicating potential imbalance. Where imbalances were identified, we estimated an additional model including all known pre-treatment characteristics as predictors as a sensitivity analysis.

The pupil-level characteristics we compared included:

- gender;
- baseline Key Stage 2 science attainment;
- baseline Key Stage 2 maths attainment; and
- baseline Key Stage 2 reading attainment.

At the school level, we compared the following characteristics to assess balance:

- school type (e.g. local authority-maintained, academy, etc.);
- region;
- urban-rural setting;
- proportion of pupils eligible for FSM; and
- school-level GCSE attainment.

We report the balance of school- and pupil-level characteristics in Table 10 in the 'Pupil and school characteristics' section below.

Estimation of effect sizes

In line with the EEF guidance (EEF, 2022), estimates for the primary outcome, GCSE science attainment, and the two secondary outcomes, GCSE maths and GCSE English attainment, were reported as standardised effect sizes using Hedges' g with 95% confidence intervals (CIs).

The Hedges' g effect size was estimated following Hedges (2007) for designs with unequal sample sizes. The effect size, g_t , was estimated as follows:

$$g_t = J \times \left(\frac{\bar{Y}_{ij}^{T} - \bar{Y}_{ij}^{C}}{S_T} \right)$$

where $\bar{\boldsymbol{Y}}_{ij}^{\boldsymbol{T}}$ and $\bar{\boldsymbol{Y}}_{ij}^{\boldsymbol{C}}$ are the grand means of the ASCENTS and control groups. The remaining terms are calculated as follows:

The correction factor J is defined as:

$$J = 1 - \left(\frac{3}{4(N^T + N^C - 2) - 1} \right)$$

The pooled SD, S_T is defined as:

$$S_T = \sqrt{\frac{\sum_{i=1}^{m^T}\sum_{j=1}^{n_i^T}(Y_{ij}^T - \bar{Y}_{ij}^T)^2 + \sum_{i=1}^{m^C}\sum_{j=1}^{n_i^C}(Y_{ij}^C - \bar{Y}_{ij}^C)^2}{N-2}}$$

The variance term is calculated as follows:

$$V\{g_t\} = \left(\frac{N_T + N_C}{N_T N_C}\right) + \frac{\delta_g^2}{2(N-2)}$$

For the secondary outcome of progression to science A level, we report a relative risk ratio (RRR) with 95% CIs.

Estimation of ICC

Although the evaluation used a one-level model, we also ran a two-level model for the purposes of informing future research. The unconstrained ICC was calculated separately from the analysis model by running a multilevel model, including only 'assignment to ASCENTS' as a covariate and a random effect for schools. The ICC was estimated with the post-estimation command *estat icc* in Stata v17, using the following formula:

$$\boldsymbol{\rho} = \frac{\boldsymbol{\sigma_B^2}}{\boldsymbol{\sigma_B^2} + \boldsymbol{\sigma_W^2}}$$

Where $\boldsymbol{\sigma_B^2}$ is the between-school variance, $\boldsymbol{\sigma_W^2}$ is the within-school variance. Values of *p* range from 0 to 1, where values closer to 0 imply that the within-cluster variance is much greater than the between-cluster variance.

Longitudinal analysis

A longitudinal follow-up analysis will explore the following research question:

4. What is the impact of ASCENTS on the proportion of pupils who go on to enrol on a science A level?

To address research question 4, the intended outcome measure will be a binary variable indicating whether pupils sat an A level or AS level science exam in any of the biology, chemistry, or physics subjects. This measure acts as a proxy for whether pupils go on to study science at A level and this information will be collected from the NPD in 2026, two years after the collection of GCSE attainment data. As a result, findings for this outcome are not presented in the current report and will be discussed in a separate addendum once data become available.

This outcome will capture whether pupils achieved a grade in a science A level or AS level examination, rather than whether they initially enrolled on a science A level course. As such, it may undercount pupils who enrol but later withdraw or do not progress to sitting an examination. However, attainment data recorded in the NPD provide a clear and consistently collected indicator that a pupil sat an A level science examination and are therefore, likely to be closely aligned with enrolment for most pupils.

Analysis for research question 4 will follow the same method as previous analyses on an ITT basis, implementing a single-level logistic regression model including Key Stage 2 baseline science attainment as per the primary analysis, a binary variable indicator capturing ASCENTS or science teaching as usual group allocation and a set of binary variables representing fixed effects at the school level to control for the differences between schools.

The model will take the following form:

$$(6)\ Progression\ to\ A\ level\ Science_{ij} = \beta_0 + \beta_1 KS2Science_{ij} + \beta_2\, intervention_{ij} + school_j + \varepsilon_{ij}$$

In line with the EEF guidance (EEF, 2022), we will express effect sizes from the longitudinal analysis as risk ratios which are easier to interpret than other options. Relative risk is the ratio of the probability of an event occurring in an exposed or treatment group versus the probability of the event occurring in the non-exposed or control group (Ferguson, 2009). In the

context of ASCENTS, the 'relative risk' is interpreted as the ratio of the probability of progressing to a science A level among pupils in the ASCENTS group compared to the probability of progressing to a science A level among those in the control group.

We will calculate the RRR using the following formula:

$$(7)\ RRR = \frac{\mathrm{P(Progression\ to\ A-Level\ Science|ASCENTS,X)}}{\mathrm{P(Progression\ to\ A-Level\ Science|non-ASCENTS,X)}}$$

In equation (7) the numerator is the probability of progressing to science A level for ASCENTS cases conditional on a vector of covariates (denoted as X in the formula), and the denominator is the probability of progressing to science A level for non-ASCENTS cases, conditional on the same set of covariates. If the risk ratio is greater than one this would suggest that ASCENTS participation is associated with a higher likelihood of progressing to science A level. Conversely, a risk ratio of 1 would mean no impact, and less than one would signify that ASCENTS participants are less likely to progress.

IPE

A mixed-method IPE was delivered alongside the impact evaluation. This included surveys, interviews, and focus groups with the delivery team and participants as well as observations of key activities. Table 7 provides an overview of the IPE methods including achieved response rates for data collection activities. During the trial, we agreed with the EEF and the developer to change the approach to interviews with mentors and teachers. Originally, the plan was to speak to 14 teachers and 14 mentors for interviews lasting 20–30 minutes. We felt, however, that we would generate greater insights by being able to speak to a fewer number of participants (seven in each group), while still aiming for coverage across the university partners, for 45–60-minute interviews. This allowed us to explore their views and experiences in greater depth.

Response rates for the IPE surveys were lower than anticipated. The impact of low response rates are discussed in the 'IPE results' section.

Table 7: IPE methods overview

Research methods	Data collection methods	Participants / data sources	Data analysis methods	IPE research questions addressed	Implementation / logic model relevance
University partner interviews	Online / telephone	7 pre-intervention interviews and 5 post-intervention interviews	Thematic analysis	1–10; 20–25	Fidelity, dosage, reach, mentor responsiveness, cost, wider outcomes
Lead developer interview	Online	1 encounter	Thematic analysis	1–10; 20–25	Fidelity, dosage, reach, mentor responsiveness, cost, wider outcomes
Mentor training observations	Face-to-face	3 observations	Thematic analysis	1, 2; 7–10	Fidelity, dosage, reach, mentor responsiveness, mentee responsiveness, differentiation, contamination, context, cost, wider outcomes
School lead surveys	Online	Pre-intervention – 36 out of 57 Post-intervention – 28 out of 57	Descriptive	1, 2; 11–19; 21–25	Fidelity, mentee responsiveness, differentiation, contamination, context, wider outcomes
Mentor surveys	Online	Pre-intervention – 174 out of 341 Post-intervention – 113 out of 341	Descriptive	1–14; 21–25	Fidelity, dosage, reach, mentor responsiveness, mentee responsiveness, wider outcomes
Mentor interviews	Online / telephone	6 mentors x 1 encounter (post)	Thematic analysis	1–14; 21–25	Fidelity, dosage, reach, mentor responsiveness, mentee responsiveness, wider outcomes
Mentoring observations	Face-to-face	7 observations	Thematic analysis	1–14; 21–25	Fidelity, mentor responsiveness, mentee responsiveness
Attendance register	Secure online register	267 out of 374 pupils (weekly)	Descriptive	1–6	Fidelity, dosage, reach
Cost pro-forma	Online	28 out of 57 schools x 1 encounter (post) 7 universities x 1 encounter (post)	Descriptive	20	Cost
Lead teacher interviews	Face-to-face / telephone	4 teachers x 1 encounter	Thematic analysis	1, 2; 7–19; 21–25	Fidelity, mentor responsiveness, mentee responsiveness, differentiation, contamination, context, wider outcomes
Mentee survey	Online	41 out of 374 (post)	Descriptive	1–6; 11–17	Fidelity, dosage, reach, mentee responsiveness, differentiation, contamination, wider outcomes
Pupil control group survey	Online	13 out of 391 pupils (post)	Descriptive	15–17	Differentiation, contamination, wider outcomes
Mentee focus groups	Face-to-face	5 focus groups x 1 encounter	Thematic analysis	1–4; 11–17	Fidelity, dosage, mentee responsiveness, differentiation, contamination

Research methods

Research instruments for this trial were based on the instruments used in the 2019/2020 efficacy trial. We collaborated with the developer and the EEF to agree the content of the survey questionnaires, topic guides, and observation frameworks. They were not piloted for use in this trial. We took care to ensure that questions were not leading, and all research instruments were quality assured by senior members of the evaluation, which included checking them against the IPE dimensions of interest, checking them against the logic model, and timing the length of time required to complete the questionnaires. All research instruments can be found in Appendices J–S.

Survey data were analysed using the statistical software SPSS (SPSS Inc., Chicago, Illinois, USA) and the qualitative data were analysed using the Framework method developed by NatCen (Ritchie *et al.,* 2013). Steps taken to ensure rigour and minimise bias as discussed in the 'Analysis' section of this chapter. Participants were not offered incentives for taking part in IPE interviews, focus groups, or surveys.

Research with mentors

Pre-intervention mentor survey

The pre-intervention mentor survey was an online survey that collected data on: i) mentors' profile and background; ii) mentoring experience; iii) career aspirations; iv) motivation to take part in ASCENTS; v) experience of ASCENTS so far (application, training); and vi) expectations about ASCENTS and mentoring. The survey was designed in-house by NatCen and administered online. It was distributed in September – October 2023 during the mentor training sessions. No incentives were used. The expected completion time was 15 minutes. The survey can be found in Appendix J.

Post-intervention mentor survey

The post-intervention mentor survey was an online survey that collected data on: i) mentors' experience of ASCENTS (delivery of the mentoring sessions, interactions with students, teachers, and university partners); ii) study plans; and iii) career aspirations. The survey was designed in-house by NatCen and was live from June – July 2024. No incentives were used. The expected completion time was 15 minutes. The survey can be found in Appendix J.

Post-intervention mentor interviews

Post-intervention semi-structured interviews were conducted online or via telephone with six mentors from June – July 2024. Invitations to take part were sent to all mentors. Mentors who responded positively were then selected at random and we aimed to speak to one mentor from each participating university, though this was not achieved. Topic guides were informed by the pre-intervention mentor survey and explored:

- mentors' experiences participating in ASCENTS;
- the challenges and benefits of participating in ASCENTS;
- mentors and mentees engagement with ASCENTS;
- the mentor–mentee relationship;
- suggestions for improving the programme (post-intervention); and
- mentors' long-term plans.

The duration of the interviews was around 45–60 minutes. The topic guide can be found in Appendix K.

Research with mentees

Post-intervention pupil survey

Pupils in both the treatment and control group were sent the post-intervention pupil survey. After answering a few introductory questions, pupils were either routed to the mentee survey or the control group survey. The aim of this online survey was to capture: i) motivations, confidence, and attitudes towards science, as well as; ii) other usual teaching practice and support pupils receive; and iii) any potential spillover from treatment pupils (mentees) to control and/or other pupils and their school. In addition, in the mentee survey, mentees were asked to report on experiences of the programme, their relationships with their mentor, and any perceived impacts of the programme.

The survey was designed in-house and conducted in May – July 2024. The expected completion time was 15 minutes. To encourage completion, we sent reminders to mentees, and we also asked that mentors and teachers remind mentees to complete the survey.

The survey can be found in Appendix L.

Post-intervention mentee focus groups

Five focus groups with 22 ASCENTS mentees were conducted in-person in April – May 2024. Schools and mentees were sampled so one school was selected per university partner. The intention was to hold a focus group at all seven schools where mentoring sessions were observed, however, two schools were unable to accommodate the focus groups. The focus groups used a semi-structured topic guide that explored:

- how mentees felt about the mentoring sessions;
- perceived pros and cons of mentoring; and
- whether they discussed the support they received with, or took on opportunities to tutor or mentor, friends and peers (spillovers).

The duration of the focus groups was around 60 minutes. The topic guide can be found in Appendix M.

Research with ASCENTS school leads

Pre-intervention school survey

The pre-intervention school survey gathered contextual information about the school and their science provision. This included the types of additional science activities or extra help that are available to students and their arrangement to facilitate mentoring sessions.

The survey was designed in-house and conducted online in September – October 2023. The expected completion time was ten minutes. The survey can be found in Appendix N.

Post-intervention school survey

The aim of this survey was to collect up-to-date contextual information on: i) the types of additional science support provided to students and level of take-up; and ii) the control condition (i.e. any usual practice control pupils received). It gathered information on how the mentoring sessions were delivered in schools, intervention dosage, and any perceived benefits or challenges for the school, whole class, and individual students. Questions covered how randomisation was perceived by pupils and whether there was any contamination, by control pupils either taking part in the intervention or through mentees sharing learning with control pupils.

The survey was designed in-house and conducted in June – July 2024. The delivery mode of this survey was online. The expected completion time was 15 minutes. The survey can be found in Appendix N.

Post-intervention school lead interviews

Semi-structed interviews were conducted online with four school leads in June – July 2024. All school leads were asked if they would like to take part in a post-intervention interview. Of those who responded positively, we sought to speak with one school lead per university and a mix in terms of number of mentees, proportion of pupils eligible for FSM, and the Office for Standards in Education, Children's Services and Skills (Ofsted) rating. Topic guides were informed by the pre-intervention school survey and explored:

- business as usual tutoring and mentoring within the schools;
- teachers' experiences with the delivery of ASCENTS including challenges encountered and what could be improved; and
- teachers' perceptions of the wider outcomes of the project, including classroom learning dynamics of teaching/learning, student engagement with the teachers and the teaching materials, students' attitudes and interest in science, and progress made by non-participating students, and teachers' workload and class management.

The duration of the interviews was around 60 minutes. The topic guide can be found in Appendix O.

Research with the delivery team

Pre-intervention university partner interviews

All seven university partners were interviewed in November – December 2023 either online or by phone. These interviews followed a semi-structured topic guide (Appendix P) to gather information on:

- motivations to take part in ASCENTS;
- approaches to mentor recruitment and school recruitment;
- mentor training;
- the allocation of mentors to mentees;
- planned support that was to be provided over the course of the school year for mentors and schools; and
- the relationship between university partners, the lead university, and other universities.

The duration of the interview was around 45 minutes. The topic guide can be found in Appendix P.

During delivery lead developer interview

The interview with the lead developer (Professor Abrahams, University of Roehampton) followed a similar topic guide to the university partner interviews and covered questions about their experiences of the overall delivery of the programme and perspectives on recruitment, as well as both student and partners engagement and behaviours.

The duration of the interview was around 45 minutes.

Post-intervention university partner interviews

Seven university partners were invited to take part in post-intervention interviews. Five university partners were interviewed in June – July 2024 either online or over the phone. The interviews followed a semi-structured topic guide and gathered information on:

- views and experiences of delivering ASCENTS;
- mentor and mentee retention and delivery of ASCENTS;
- refinements and adaptations that were made when delivering ASCENTS;
- drivers and barriers to the delivery of ASCENTS;
- perceived engagement and outcomes of ASCENTS; and
- support provided and received by the lead university and other universities.

The duration of the interviews was around 45 minutes. Topic guides can be found in Appendix P.

Observations

Mentor training observation

The second day of training was observed in three universities. The aim of these observations was to understand:

- how the delivery team framed the benefits of ASCENTS for mentors;
- what support the team offered mentors to overcome potential obstacles;

- how detailed was the advice the team gave to mentors;
- whether key risks were identified and discussed; and
- the level of engagement of mentors.

These observations were conducted by one researcher per setting and were guided by a thematic framework March – April 2024. The mode was in-person. The duration of each observation was one day. The observation protocol that was used can be found in Appendix R.

Mentoring session observation

Seven mentoring sessions in the second half of the programme were observed across the seven university partnership areas. Six observations were held at regular in-school mentoring sessions and one observation was held at the university-based Revision Day.

The aim of these observations was to assess the fidelity of implementation and the responsiveness of mentors/mentees. The observations examined:

- the punctuality of sessions;
- the structure of the session;
- the extent to which mentors/mentees ask the teacher for assistance;
- the type of questions (substantive questions versus more 'pastoral' questions), where possible;
- references to previous sessions; and
- the body language and perceived rapport between mentor and mentee.

These observations were conducted by one researcher per setting and were guided by a thematic framework. They were carried out between January – May 2024. The mode was in-person. The duration of each mentoring session observation was 60 minutes, while the Revision Day was observed for six hours). The observation guide for these observations can be found in Appendix S.

Monitoring information

Prior to the post-intervention interviews, university partners were asked to share monitoring information with NatCen about the implementation of the programme (e.g. number of mentors recruited and retained, number of mentees recruited and retained, and number of ASCENTS sessions held), and the time spent delivering ASCENTS (with a view to estimating the true cost of the programme).

University partners were provided with a pro-forma to share monitoring information in a consistent way (Appendix Q). This information was shared via a secure file transfer portal (FTP) and was discussed during interviews. In addition to this more formal reporting of monitoring information, NatCen was in regular contact with university partners, particularly to discuss any issues with mentor and mentee dropout, including whether they were replaced, and the impact this could be having on the study.

Attendance data

All participating schools were asked to record data on pupil attendance at mentoring sessions on a weekly basis. The aim of asking schools to collect this data was twofold:

- to allow the IPE to assess dosage (i.e. the extent to which mentors delivered/mentees attended mentoring sessions and how long delivery sessions lasted); and
- for the impact evaluation to calculate levels of pupil compliance.

The impact evaluation used this data to reduce the effect of any non-compliance on the effect size, and the measures of dosage (alongside reach and responsiveness) contributed to our understanding of fidelity (e.g. the extent to which ASCENTS 1-2-1 is delivered as intended). Each school was sent a unique secure website, where teachers could access a list of participating pupils, obtained from the pupil uploads, and register their attendance at sessions each week. These secure websites were created by the NatCen Survey Programming team and were sent to schools on a weekly basis. Teachers were compensated for their time collecting this data through £50 Love2Shop e-vouchers at two points during the academic year.

Attendance records for any mentoring or tutoring support that the control group attended were not collected as part of the evaluation.

Analysis

All qualitative interviews and focus groups were digitally recorded (with permission from participants) and transcribed. All observations were recorded using detailed fieldnotes.

The raw qualitative data was managed using the Framework approach, developed by NatCen (Ritchie *et al.,* 2013). Using this approach, we developed thematic frameworks for each research activity (e.g. lead teacher interviews, mentor interviews, pupil focus groups), using themes from the topic and observation guides, and other themes emerging from the data. The analytical frameworks were designed to organise data against the elements on the logic model, including the moderating factors and unintended consequences. We were interested in understanding both whether participants experienced the programme elements detailed on the logic models and how they experienced them, including barriers and enablers. These frameworks were assembled into matrices, where each row represents an individual interview, observation or discussion group, also called a 'case', and each column a 'theme' (with any related sub-themes). Transcripts and observation notes were reviewed in detail, and through a process called 'charting' data was summarised and categorised systematically by theme, using illustrative verbatim quotes where appropriate.

Charted data were analysed by 'theme', across participants, and by 'case' across themes. We used a mixed deductive/inductive approach to thematic analysis, using the pre-established themes included in the charting framework (as discussed above), as well as identifying themes emerging from the data. This allowed for the mapping of the full range of views and experiences and identifying commonalities and differences across research participants.

NatCen also managed and analysed survey and monitoring data (e.g. attendance data) using the statistical software SPSS and also Excel. These data were analysed using descriptive statistics including frequency distributions and cross-tabulations. Where possible, we also looked at differences over time for surveys conducted pre- and post-intervention (e.g. mentor survey). We linked mentor data from the pre- and post-intervention surveys and examined how mentor attitudes change over time at a group level. We considered conducting between group t-tests to explore whether there were statistically significant differences between the control pupil and mentee survey IPE survey results; however, the response rates did not provide a large enough sample for this analysis.

The data collected through the IPE were triangulated and synthesised to answer the IPE research questions. Where possible, these findings were also compared to the findings from the IPE from the previous ASCENTS trial, to look for consistency in delivery and across IPE dimensions.

Cost

We collected and analysed cost data from both schools and the delivery team for the intervention in line with the EEF guidelines (EEF, 2023).

To obtain information on the costs of taking part in the ASCENTS programme for schools, cost-related questions were included in the post-intervention school survey part of the IPE. The questions explored the categories of personnel costs for implementation of the programme and included teacher time for the following intervention-related activities:

- time spent on recruiting pupils to the ASCENTS programme;
- time spent on supervising mentoring sessions and Revision Day; and

- time spent on Revision Day.

The post-intervention school survey was completed by 28 teachers. In line with the EEF guidance (EEF, 2023), our analysis focuses on the *additional* cost incurred by exploring responses of the teachers who delivered ASCENTS on the questions above. The results we report are based on non-missing responses for each time unless otherwise detailed.

In addition to the costs collected from schools, a form was sent to each university partner to collect information on delivery team costs. Six out of seven university partners completed the form. The form covered the following categories:

- personnel costs for preparing programme delivery;
- personnel costs during training for implementation of the programme;
- personnel costs for the implementation of the programme; and
- facilities, equipment, and materials for implementation.

Data from schools and university partners was used to calculate the per-pupil cost of implementation over three years (EEF, 2023), categorising costs into pre-requisites, start-up, and recurring costs. Per-pupil cost estimates were based on the number of pupils randomised into the ASCENTS programme.

Timeline

Table 8: Timeline

Dates	Activity	Staff responsible / leading
February 2023	Finalised recruitment materials for schools	NatCen
February 2023 – early July 2023	Recruitment of schools Schools signed MoUs Schools informed eligible pupils and parents/carers Schools received permission from parents/carers for pupils to participate	University partners Participating schools
August 2023	Pre-intervention university partners interviews	NatCen
May 2023 – September 2023	Schools shared pupil data with NatCen Mentor training observations Pre-intervention mentor survey Pre-intervention teacher survey	NatCen
Early October 2023	Randomisation of pupils Randomisation allocation shared with schools	NatCen
w/c 09 October 2023 – May 2024	ASCENTS 1-2-1 delivery	University partners
January 2024 – May 2024	Mentoring sessions observations	NatCen
May 2024	Mentee focus groups Post-intervention mentee survey	NatCen
June 2024	Post-intervention mentor survey Post-intervention mentor interviews Post-intervention teacher survey Post-intervention teacher interviews	NatCen
July 2024	Post-intervention university partners interviews	NatCen
December 2024	NPD GCSE exam data request	NatCen
July 2025 – November 2025	Receipt of NPD GCSE exam data Analysis of NPD GCSE exam data Drafted first evaluation report	NatCen
December 2025	Submission of draft report to the EEF	NatCen
December 2025	Submission of updated report to the EEF Submission of data to the EEF archive	NatCen The EEF

Dates	Activity	Staff responsible / leading
	Updating of ISRCTN OSF registry with results	
December 2025	Follow-up mentor survey	NatCen
October 2026	NPD A level exam data request	NatCen
April 2027 – June 2027	Receipt of NPD A level exam data Analysis of NPD GCSE exam data Incorporate A level findings into report	NatCen
July 2027	Submission of updated evaluation report to the EEF (including pupil follow-up); submission of data to the EEF archive and updating of ISRCTN OSF registry with results	NatCen
November 2026	Follow-up mentor survey	NatCen
November 2027	Follow-up mentor survey	NatCen
July 2028	ITTPP and SWC data requests	NatCen
January 2029 – March 2029	Receipt of ITTPP and SWC data Analysis of ITTPP and SWC data Incorporate mentor follow-up findings into final report	NatCen
Spring 2029	Submission of final evaluation report to the EEF	NatCen

Impact evaluation results

Participant flow including losses and exclusions

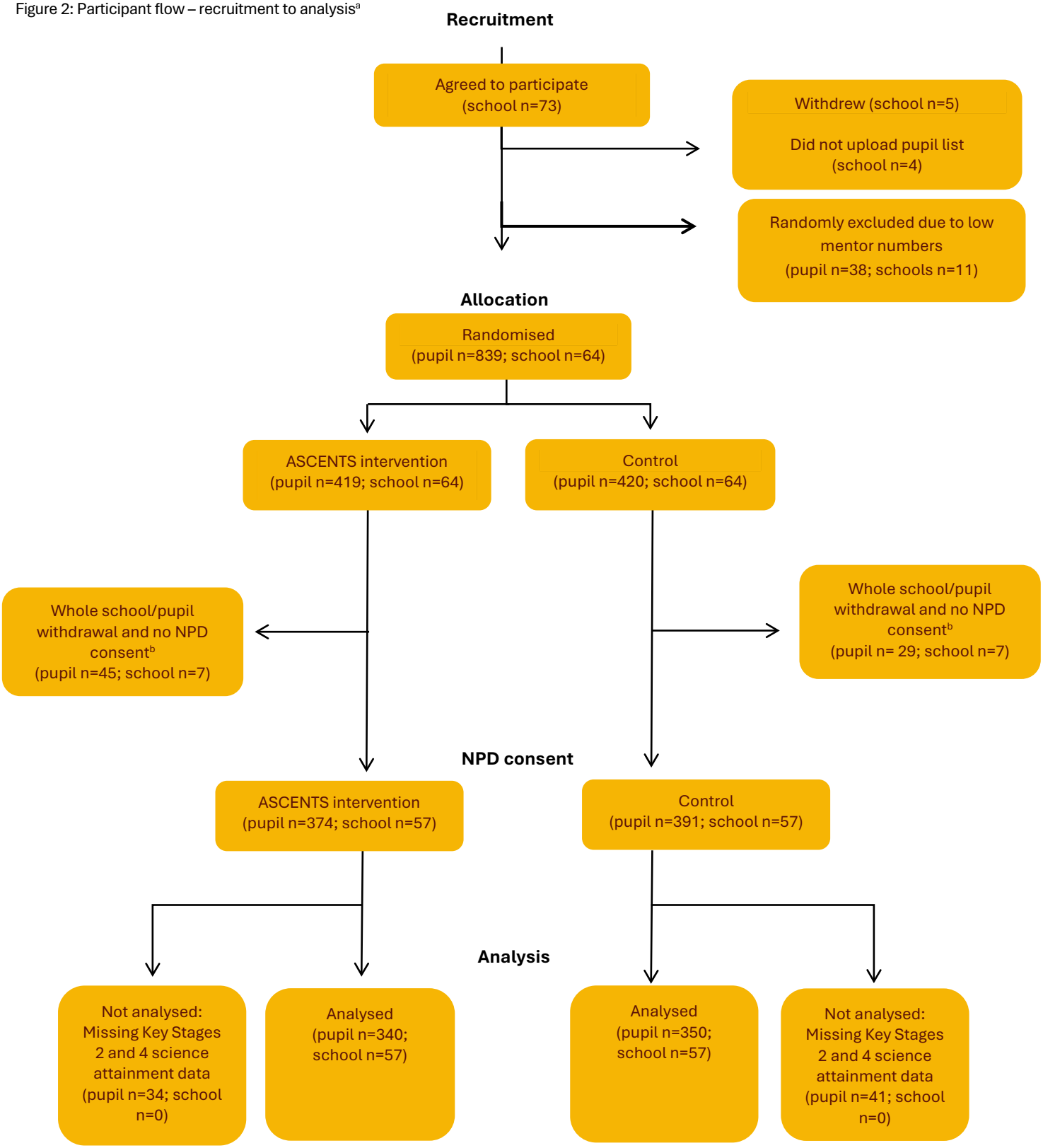
Figure 2 presents the participant flow diagram from recruitment to analysis stage. The University of Roehampton and partner universities recruited eligible schools through their outreach teams and teacher training programmes. In total, 73 schools signed an MoU and sent it to NatCen by email. However, five schools withdrew before randomisation and four schools did not upload a pupil list for randomisation; these nine schools were removed from the sample.

A total of 64 schools provided a pupil list for randomisation (877 pupils eligible for Pupil Premium in total). In some cases, the university partners were unable to recruit enough mentors to cover all pupils in the trial. Consequently, 38 pupils across 11 schools were randomly excluded from the study before randomisation took place. This resulted in 839 pupils across 64 schools being randomised: Around 419 to the ASCENTS intervention group and 420 to the control group.

Following randomisation, seven schools withdrew from the trial. To avoid statistical disclosure, the associated pupil withdrawals from these schools and individual pupil-level withdrawals are reported together. In total, 74 pupils across the intervention and control groups withdrew for reasons such as pupils no longer wanting to participate, schools being unable to support the programme for only a small number of pupils, and challenges related to mentor attendance and mentor availability; their data were not processed.

In total, NPD consent was obtained for 765 pupils across 57 schools (374 intervention; 391 control). A total of 75 pupils were excluded from analysis due to missing Key Stage 2 and/or Key Stage 4 science attainment data. The final sample for the primary outcome analysis comprised 690 pupils (340 intervention; 350 control) across 57 schools. More details can be found in the ‘Attrition’ section below.

Figure 2: Participant flow – recruitment to analysis[a]



[a] Randomisation was conducted at the pupil level within schools; therefore, the same number of schools appear in both the intervention and control arms at each stage.

[b] To avoid statistical disclosure due to small pupil counts, the number of whole-school withdrawals and individual pupil withdrawals has been combined.

Attrition

Pupil-level attrition was monitored throughout the trial from randomisation to analysis. Between randomisation and the NPD consent stage, attrition was 10.74% in the intervention group and 6.90% in the control group, representing 8.82% overall. Further details on participant losses and exclusions are provided in the 'Participant flow including losses and exclusions' section above. At this stage, NPD consent was obtained for 765 pupils (374 intervention; 391 control) across 57 schools.

In the NPD records obtained, baseline Key Stage 2 data were available for 734 pupils and Key Stage 4 data were available for 762 pupils.

In total, 75 pupils from the NPD-consented sample were excluded from the primary analysis because they did not have Key Stage 2 science attainment and/or Key Stage 4 science attainment recorded. The final primary analysis sample therefore, comprised 690 pupils (340 intervention; 350 control). For the primary analysis, attrition from the NPD consent stage to analysis was 9.09% in the intervention group and 10.49% in the control group, representing 9.80% overall.

Across the full trial period, attrition was 18.85% for the intervention group, 16.67% for the control group, and 17.76% overall. Table 9 presents pupil-level attrition across the trial stages.

Table 9: Pupil-level attrition from the trial (primary outcome)

			Intervention	Control	Overall
Randomised to NPD consent	No. of pupils	Randomised	419	420	839
		NPD consent	374	391	765
	Pupil attrition	Number	45	29	74
		Percentage	10.74%	6.90%	8.82%
NPD consent to analysed	No. of pupils	NPD consent	374	391	765
		Analysed	340	350	690
	Pupil attrition	Number	34	41	75
		Percentage	9.09%	10.49%	9.80%
Randomised to analysed	No. of pupils	Randomised	419	420	839
		Analysed	340	350	690
	Pupil attrition	Number	79	70	149
		Percentage	18.85%	16.67%	17.76%

Pupil and school characteristics

To assess the balance of pupil and school characteristics at baseline, we present descriptive statistics for pupils and schools that provided NPD consent. Baseline attainment measures were not available at randomisation and could only be obtained through NPD linkage; therefore, balance is assessed for the NPD consent sample rather than for the full randomised sample.

Table 10 shows pupil- and school-level characteristics for the intervention and control groups within the NPD consent sample. All distributions are presented at the pupil level; accordingly, school-level characteristics are reported as the proportion of pupils attending schools of each type or category. For school-level characteristics, the distribution of school type and region was closely aligned across groups, with 83% of pupils in the intervention group and 82% in the control group attending academies, and 87% of pupils in both groups attending schools located in urban areas. The regional distribution was also comparable, and the distribution of Ofsted ratings was similarly aligned across groups. The mean school-level proportion of pupils eligible for FSM showed very little difference across groups (34.78 in the intervention group and 34.60 in the control group). The mean school-level GCSE attainment score at baseline was also very similar (61.80 in the intervention group and 62.04 in the control group). To provide national context, school-level FSM eligibility and GCSE attainment were summarised across all open, non-selective, state-funded secondary schools in England where data were available, including those participating in the trial. Nationally, mean FSM eligibility was 27.58 (3,445 schools), and mean GCSE attainment was 58.23 (3,528 schools), both of which were slightly lower than the corresponding averages observed in the trial schools. These national comparisons are provided for descriptive context only and are not intended to inform interpretation of programme impacts.

Table 10: Baseline characteristics of groups as randomised

School level (categorical)	National-level mean (SD)	Intervention group		Control group		
		n/N (missing)	Count (%)	n/N (missing)	Count (%)	
School type: Academy		310/374 (0)	83%	322/391 (0)	82%	
School type: Local authority-maintained		64/374 (0)	17%	69/391 (0)	18%	
Region: East Midlands		78/374 (0)	21%	80/391 (0)	20%	
Region: East of England		41/374 (0)	11%	45/391 (0)	12%	
Region: London		49/374 (0)	13%	51/391 (0)	13%	
Region: North-East		67/374 (0)	18%	70/391 (0)	18%	
Region: North-West		83/374 (0)	22%	85/391 (0)	22%	
Region: South[a]		25/374 (0)	7%	26/391 (0)	7%	
Region: Yorkshire and the Humber		31/374 (0)	8%	34/391 (0)	9%	
Region: Rural		47/374 (0)	13%	52/391 (0)	13%	
Region: Urban		327/374 (0)	87%	339/391 (0)	87%	
Ofsted rating: Outstanding		67/374	18%	71/391	18%	
Ofsted rating: Good		211/374	56%	217/391	56%	
Ofsted rating: Requires improvement or Inadequate[b]		96/374	26%	103/391	26%	
School level (continuous)		n/N (missing)	Mean (SD)	n/N (missing)	Mean (SD)	
School-level FSM	27.58 (14.34)	374/374 (0)	34.78 (15.70)	391/391 (0)	34.60 (15.82)	
School-level GCSE attainment[c]	58.23 (22.34)	371/374 (3)	61.80 (13.34)	389/391 (2)	62.04 (13.42)	
Pupil level (categorical)		n/N (missing)	Count (%)	n/N (missing)	Count (%)	
Gender: Male		180/374 (0)	48%	178/391 (0)	46%	
Gender: Female		194/374 (0)	52%	213/391 (0)	54%	
Key Stage 2 science: Working below expected standard		92/374 (16)	25%	90/391 (17)	23%	
Key Stage 2 science: Working at expected standard		266/374 (16)	71%	284/391 (17)	73%	
Pupil-level (continuous)		n/N (missing)	Mean (SD)	n/N (missing)	Mean (SD)	Effect size
Key Stage 2 maths		354/374 (20)	65.90 (22.15)	371/391 (20)	64.38 (22.75)	-0.07
Key Stage 2 reading		354/374 (20)	29.68 (9.58)	370/391 (21)	28.96 (9.95)	-0.07

[a] *To avoid statistical disclosure due to small counts, and in accordance with DfE SRS disclosure guidance, a composite 'South' category was created by combining the South East and South West regions.*

[b] *To avoid statistical disclosure due to small counts, and in accordance with DfE SRS disclosure guidance, the categories 'Requires improvement' and 'Inadequate' have been combined.*

[c] *GCSE attainment is reported as the percentage of pupils achieving at least a grade 4 ('standard pass').*

For pupil-level characteristics, gender balance showed little difference, with 48% male and 52% female in the intervention group, and 46% male and 54% female in the control group. Key Stage 2 science attainment was also similar, with 71% of pupils in the intervention group and 73% in the control group working at the expected standard.

As specified in the 'Methods' section, an effect size greater than 0.05 was considered an indication of possible imbalance. For the Key Stage 2 attainment measures, pupils in the intervention group had a mean Key Stage 2 maths score of 65.90 compared with 64.38 in the control group (effect size = -0.07). Furthermore, the mean Key Stage 2 reading score was 29.68 in the intervention group and 28.96 in the control group (effect size = -0.07). Since both effect sizes exceeded the pre-specified imbalance threshold, we conducted a sensitivity analysis that included Key Stage 2 maths and reading attainment as covariates in the model. The results of this sensitivity analysis are presented in the 'Outcomes and analysis' section.

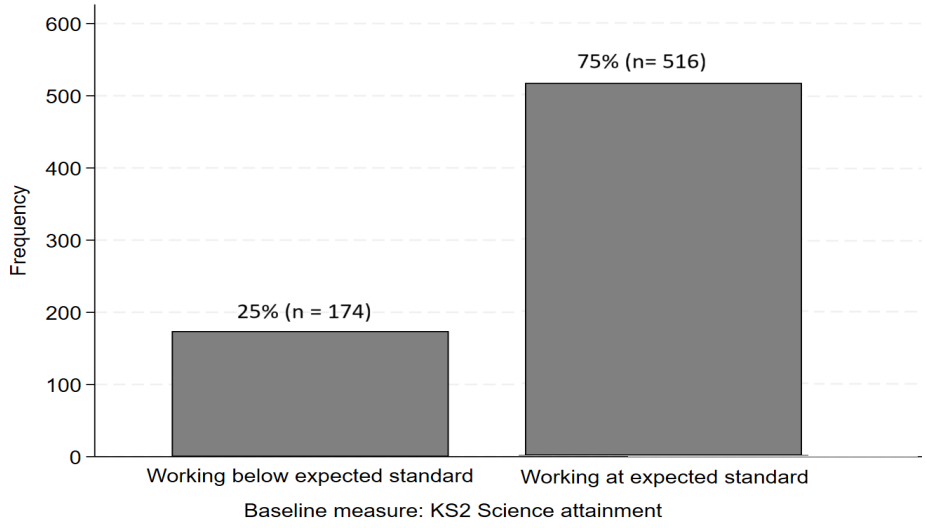
Outcomes and analysis

Primary analysis

The primary analysis explored the impact of ASCENTS on the GCSE combined science (double award) attainment of Year 11 pupils, using Key Stage 2 science attainment as the baseline measure.

Key Stage 2 science attainment was recorded as a binary indicator of whether pupils were working below or at the expected standard. Figure 3 shows that, in the primary analysis sample (690 pupils with available data), one-quarter of pupils (25%; n=174) were working below the expected standard in Key Stage 2 science, while three-quarters (75%; n=516) were working at the expected standard. An independent samples t-test was conducted to examine the association between Key Stage 2 science attainment and later GCSE science outcomes. Pupils working at the expected standard in Key Stage 2 science achieved, on average, GCSE science grades that were 1.05 points higher than those working below the expected standard (95% CI: 0.83, 1.26; p<0.001).

Figure 3: Distribution of Key Stage 2 science attainment by expected standard



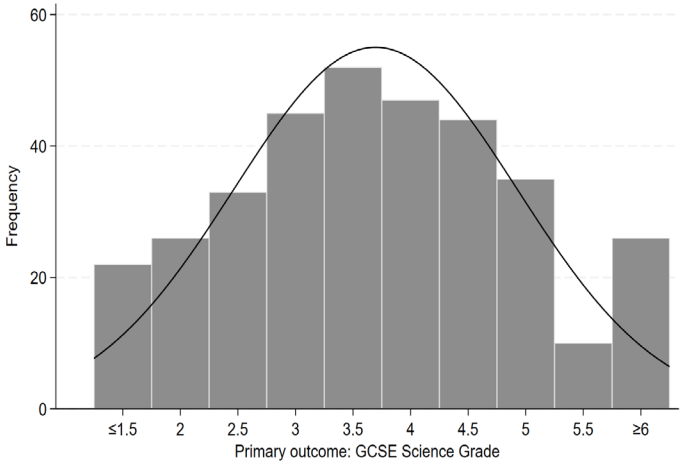
The primary outcome measure was GCSE science attainment, derived by averaging the two grades that pupils received for the GCSE combined science (double award) to produce a single continuous GCSE science grade. Across the primary analysis sample, pupils had a mean GCSE science grade of 3.68 (SD = 1.35; Skewness = 0.47; Kurtosis = 3.42).[24] In line with SRS statistical disclosure guidance, GCSE science grades were presented in ten categories for data presentation purposes only to ensure all cell counts met the minimum disclosure threshold of ten. Figure 4 presents the distribution of GCSE

[24] Skewness indicates the asymmetry of a distribution, with zero representing perfect symmetry. Kurtosis reflects the heaviness of the tails relative to a normal distribution; values below three suggest that the data have lighter tails and fewer extreme outliers. The statistics suggest that the distribution of GCSE science grades in the primary analysis sample was approximately symmetrical and close to a normal distribution, with a slight positive skew and marginally heavier tails.

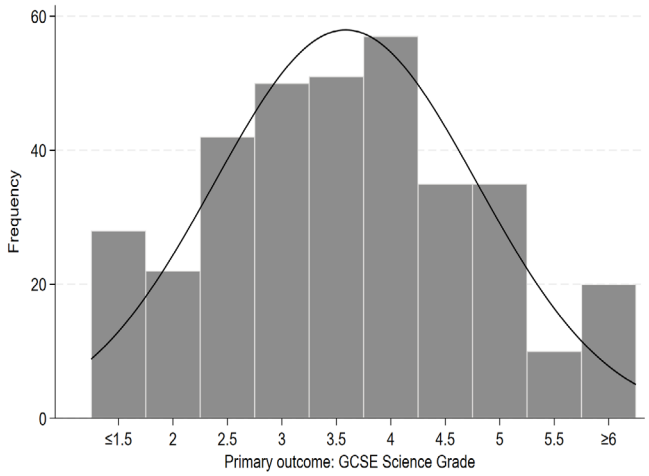
science grades separately for the intervention and control groups.[25] The intervention group had a mean grade of 3.75 (SD = 1.37; Skewness = 0.53; Kurtosis = 3.46), while the control group had a mean grade of 3.61 (SD = 1.37; Skewness = 0.39; Kurtosis = 3.34). GCSE grades in both groups were concentrated in the lower-middle range of the scale, with the intervention group showing the highest proportion of pupils achieving grade 3.5 (15.3%; n=52) and the control group showing the highest proportion at grade 4 (16.3%; n=57).

Figure 4: Distribution of GCSE science grades by group

a.) Intervention group



b.) Control group



Before interpreting the regression estimates, we examined model assumptions to confirm the validity of the results. Residuals were plotted against fitted values to assess potential heteroskedasticity (unequal variance of residuals across the variable values). In line with SRS statistical disclosure guidance, these plots are not presented. Instead, we conducted a Cameron and Trivedi Information Matrix test, which detected evidence of heteroskedasticity. We used heteroskedasticity-robust standard errors in our analysis. We also ran a Shapiro-Wilk test for normality ($W = 0.984$, $p<0.001$), which indicated that residuals were not normally distributed. However, given the large sample size (n=690), the Central Limit Theorem (CLT) supports the assumption that the estimates are approximately normally distributed, thereby supporting the validity of the results.[26]

In the primary analysis model, which controlled for baseline Key Stage 2 science attainment and included schools as fixed effects, the adjusted difference in means was 0.13 ($p = 0.144$; Table 11 and Table 12). The corresponding Hedges' g effect size was 0.10 (95% CI: -0.05, 0.25), indicating a small positive effect. This equates to two months' additional progress in GCSE science grades. However, the CI includes both zero and negative values (ranges from -0.05 to 0.25) suggesting that we are uncertain whether ASCENTS improves pupils' GCSE science attainment. The trial was powered to detect effects of approximately 0.20 SDs and was therefore, not sufficiently powered to reliably detect more modest effects, such as the one observed here.

The post-intervention ICC for the primary outcome was estimated using a multilevel model that included only assignment to ASCENTS as a covariate and a random effect for schools. The ICC was 0.156, indicating that approximately 16% of the variation in GCSE science grades was attributable to differences between schools. This suggests a moderate level of between-school variation, with pupils within the same school achieving more similar GCSE science grades than pupils in different schools.

[25] The distributions of GCSE science grades for both groups were approximately symmetrical and close to normal, with comparable variability.
[26] The CLT states that, when a sample is sufficiently large, the sampling distribution of estimates will approximate a normal distribution, even if the underlying population data are not normally distributed (Field, 2013; Wooldridge, 2016).

Table 11: Primary outcome analysis results, by GCSE science attainment

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE Science	0.14	0.13	340 (34)	1.87	350 (41)	1.75	1.81

Table 12: Primary outcome analysis, by GCSE science attainment effect size estimation

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (Intervention; control)	Hedges' g (95% CI)	P-value
GCSE science	340 (34)	3.75 (3.60, 3.89)	350 (41)	3.61 (3.47, 3.75)	690 (340; 350)	0.10 (-0.05, 0.25)	0.144

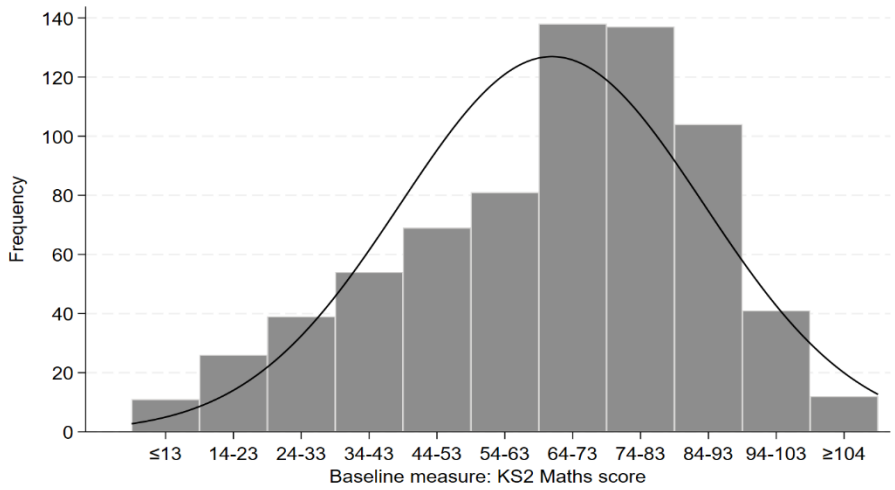
Secondary analysis

Maths GCSE attainment

The analysis explored the impact of ASCENTS on the GCSE maths attainment of Year 11 pupils, using Key Stage 2 maths attainment as the baseline measure.

Key Stage 2 maths attainment was recorded as a continuous score. Figure 5 shows that, in the analysis sample (712 pupils with available data), pupils had a mean Key Stage 2 maths score of 65.48 (SD = 22.17; Skewness = -0.54; Kurtosis = 2.61).[27] In line with SRS statistical disclosure guidance, the baseline measure was grouped into 11 categories to ensure all cell counts met the minimum disclosure threshold. The largest proportion of pupils (19.4%; n=138) scored in the 64–73 band. Key Stage 2 maths attainment was moderately associated with GCSE maths attainment (r = 0.60, p<0.001).

Figure 5: Distribution of baseline Key Stage 2 math scores



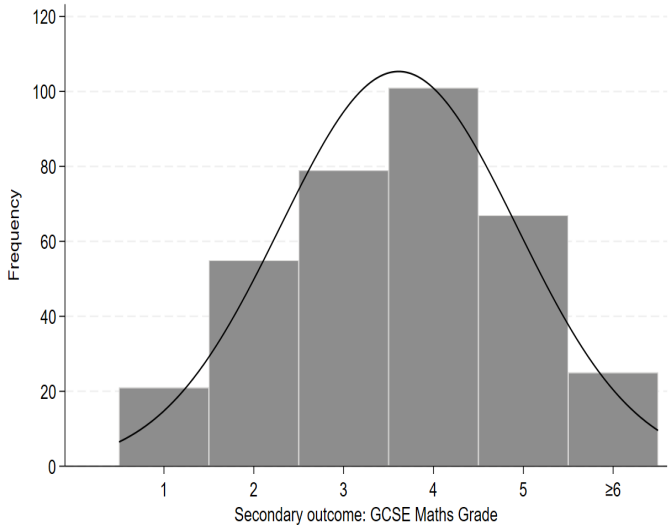
The outcome measure was GCSE maths attainment, represented by the highest GCSE maths grade achieved by each pupil and treated as a continuous variable on a 1-9 scale. Pupils in the analysis sample had an overall mean grade of 3.60 and an SD of 1.43 (Skewness = 0.18; Kurtosis = 2.87).[28] Following SRS statistical disclosure guidance, GCSE maths grades were presented in six categories for data presentation purposes only to ensure that all cell counts met the minimum disclosure thresholds. Figure 6 presents the distribution of GCSE maths grades for the intervention and control groups.[29] The

[27] The distribution of KS2 maths scores in the analysis sample was broadly normal, showing a slight negative skew.
[28] The distribution of GCSE maths grades was approximately symmetrical and close to normal, with only a very slight positive skew.
[29] The distribution of GCSE maths grades for both groups were approximately normal, with minimal skew and comparable variability.

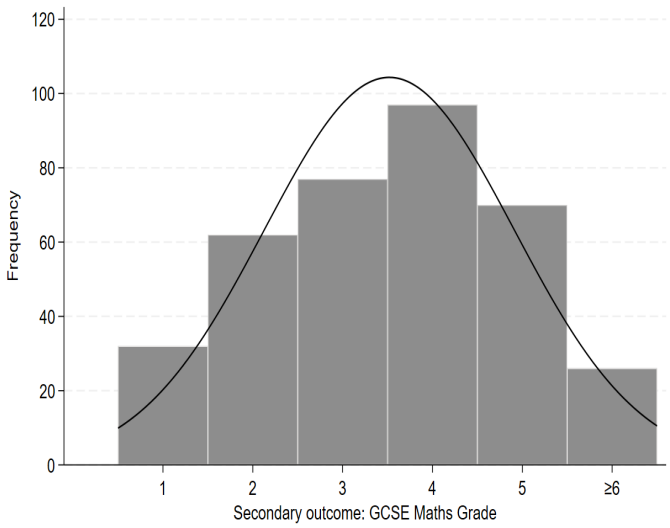
intervention group had a mean grade of 3.65 and an SD of 1.41 (Skewness = 0.26; Kurtosis = 3.15), while the control group had a mean grade of 3.55 and an SD of 1.45 (Skewness = 0.11; Kurtosis = 2.60). GCSE math grades in both groups were concentrated in the lower-middle range of the scale, with the intervention group showing the highest proportion of pupils at grade 4 (29%; n=101) and the control group at the same grade (26.60%; n=97).

Figure 6: Distribution of GCSE maths grades, by group

a) Intervention group



b) Control group



Consistent with the primary analysis, model assumptions were examined to confirm the validity of the regression results. The Cameron and Trivedi Information Matric test detected heteroskedasticity, which we addressed using heteroskedasticity-robust standard errors. The Shapiro-Wilk test for normality (W = 0.10, p=0.137) indicated that residuals were approximately normally distributed.

In the model, which controlled for baseline Key Stage 2 maths attainment and included schools as fixed effects, the adjusted difference in means was 0.07 (p = 0.426; Table 13 and Table 14). The associated Hedges' g effect size was 0.05 (95% CI: -0.10, 0.19), indicating a small positive effect. This is equivalent to one month's additional progress in GCSE maths grades. However, the 95% CI includes both zero and negative values, meaning that we are uncertain whether ASCENTS improves pupils' GCSE maths attainment.

The post-intervention ICC for GCSE maths attainment was estimated using a multilevel model that included only assignment to ASCENTS as a covariate and a random effect for schools. The ICC was 0.143, indicating that approximately 14% of the variation in GCSE maths grades was attributable to differences between schools. Similar to the primary outcome, this suggests a moderate level of between-school variation, with pupils within the same school achieving more similar GCSE maths grades than pupils in different schools.

Table 13: Secondary outcome analysis results, by GCSE maths attainment

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE maths	0.11	0.07	348 (26)	1.99	364 (27)	2.11	2.05

Table 14: Secondary outcome analysis, GCSE maths attainment effect size estimation

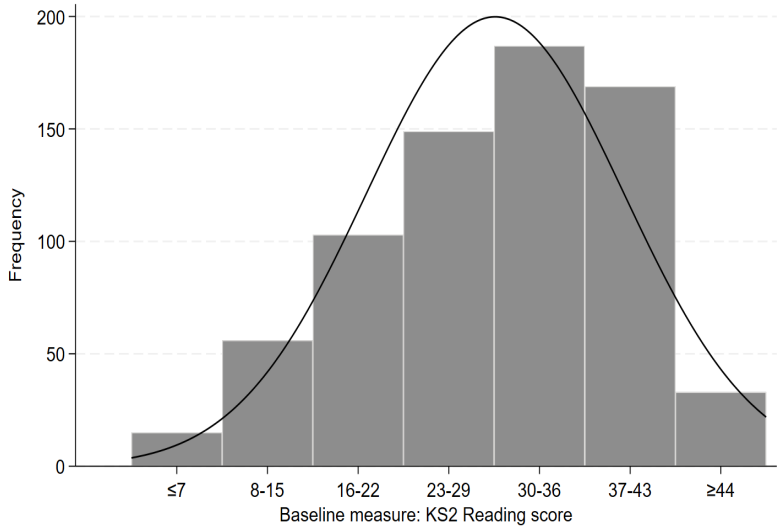
Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges' g (95% CI)	P-value
GCSE maths	348 (26)	3.65 (3.5, 3.8)	364 (27)	3.55 (3.4, 3.7)	712 (348; 364)	0.05 (-0.10, 0.19)	0.426

English GCSE attainment

The analysis explored the impact of ASCENTS on the GCSE English attainment of Year 11 pupils, using Key Stage 2 reading attainment as the baseline measure.

Key Stage 2 reading attainment was recorded as a continuous score. Figure 7 shows that, in the analysis sample (712 pupils with available data), pupils had a mean Key Stage 2 reading score of 29.38 (SD = 9.73; Skewness = -0.49; Kurtosis = 2.54).[30] In line with SRS statistical disclosure guidance, the baseline measure was grouped into seven categories to ensure that all cell counts met minimum disclosure thresholds. The largest proportion of pupils (26.3%; n=187) scored in the 30–36 band. Key Stage 2 reading attainment was weakly associated with GCSE English attainment (r = 0.42, p<0.001).

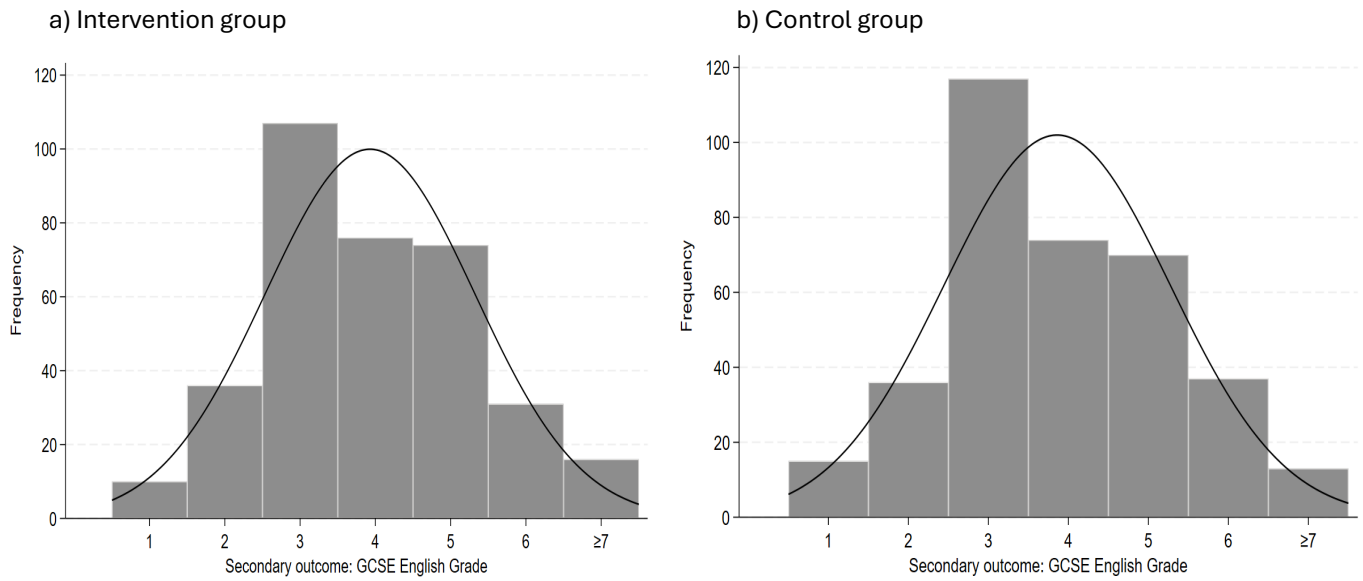
Figure 7: Distribution of baseline Key Stage 2 reading scores



The outcome measure was GCSE English attainment, represented by the highest GCSE English grade achieved by a pupil and treated as a continuous variable on a 1–9 scale. Pupils in the analysis sample had an overall mean grade of 3.91 and an SD of 1.45 (Skewness = 0.42; Kurtosis = 3.12).[31] Consistent with SRS statistical disclosure guidance, GCSE English grades were presented in seven categories for data presentation purposes only to ensure that all cell counts met the minimum disclosure threshold. Figure 8 presents the distribution of these GCSE English grades for the intervention and control groups.[32] The intervention group had a mean grade of 3.55 and an SD of 1.44 (Skewness = 0.41; Kurtosis = 3.00), while the control group had a mean grade of 3.88 and an SD of 1.47 (Skewness = 0.44; Kurtosis = 3.23). GCSE English grades in both groups were concentrated in the lower-middle range of the scale, with the intervention group showing the highest proportion of pupils at grade 3 (30.6%; n=107) and the control group also peaking at grade 3 (32.3%; n=117).

[30] The distribution of Key Stage 2 reading scores was approximately normal, with a slight negative skew.
[31] The distribution of GCSE English grades was close to normal, with a slight positive skew.
[32] The distribution of GCSE English grades in both groups were approximately symmetrical and close to normal, with only a slight positive skew.

Figure 8: Distribution of GCSE English grades, by group



In line with the primary analysis, we examined model assumptions to confirm the validity of the regression results. The Cameron and Trivedi Information Matrix test did not detect evidence of heteroskedasticity but the Shapiro-Wilk test for normality (W = 0.99, p<0.001) indicated that residuals were not perfectly normally distributed. However, given the large sample size (n=712), the CLT suggests that the sampling distribution of the estimates is approximately normal, supporting the validity of the results.

In the model, which controlled for baseline Key Stage 2 reading attainment and included schools as fixed effects, the adjusted difference in means was 0.01 (p = 0.883; Table 15 and Table 16). The corresponding Hedges' g effect size was 0.01 (95% CI: -0.14, 0.16), indicating no effect. The Hedges' g effect size of 0.01 equates to zero additional month's progress in GCSE English grades.

The post-intervention ICC for GCSE English attainment was estimated using a multilevel model that included only assignment to ASCENTS as a covariate and a random effect for schools. The ICC was 0.151, indicating that approximately 15% of the variation in GCSE English grades was attributable to differences between schools. This suggests a moderate level of between-school variation, with pupils within the same school achieving more similar GCSE English grades than pupils in different schools.

Table 15: Secondary outcome analysis results, by GCSE English attainment

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE English	0.07	0.01	350 (24)	2.07	362 (29)	2.16	2.12

Table 16: Secondary outcome analysis, by GCSE English attainment effect size estimation

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (Intervention; control)	Hedges' g (95% CI)	P-value
GCSE English	350 (24)	3.95 (3.79, 4.1)	362 (29)	3.88 (3.73, 4.03)	712 (350; 362)	0.01 (-0.14, 0.16)	0.883

Subgroup analyses

A subgroup analysis examined whether the intervention had a different impact on pupils who had been eligible for FSM in the last six years. Due to the eligibility criteria of the trial (pupils must be eligible for Pupil Premium to take part), most pupils in the analysis sample were eligible for FSM (83.2%; n=574), while 16.8% (n=116) were not.

When the analysis was restricted to FSM pupils and controlled for baseline Key Stage 2 science attainment and school fixed effects, the adjusted difference in means was 0.10 (p = 0.355; Table 17 and Table 18). The corresponding Hedges' g effect size was 0.07 (95% CI: -0.09, 0.24), indicating a small positive effect, equivalent to one month's additional progress in GCSE science grades. However, the CI includes zero and negative values, meaning we are uncertain whether ASCENTS improves GCSE science attainment among FSM pupils.

Table 17: FSM subgroup analysis results, by GCSE science attainment

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.11	0.10	283 (57)	1.73	291 (59)	1.64	1.68

Table 18: FSM subgroup analysis, by GCSE science attainment effect size estimation

Outcome	Unadjusted means				Effect size		
	Treatment group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	P-value
GCSE science	283 (57)	3.65 (3.49, 3.8)	291 (59)	3.54 (3.39, 3.68)	574 (283; 291)	0.07 (-0.09, 0.24)	0.335

An interaction model was also estimated to assess whether the intervention had a different effect for FSM pupils compared with non-FSM pupils. In this model, GCSE science attainment was regressed on treatment allocation, the FSM indicator, the interaction between treatment and FSM status, baseline Key Stage 2 science attainment, and school fixed effects. The interaction term coefficient was -0.188, with a p-value of 0.451 suggesting that ASCENTS did not have a differential impact on FSM pupils' GCSE science attainment compared with non-FSM pupils.

As a sensitivity check, we also extracted the effect size for FSM pupils from the interaction model and compared it with the effect size from the FSM-only subgroup analysis. The Hedges' g effect size was 0.08 (95% CI: -0.65, 0.80), which is similar to the effect size observed in the FSM-only subgroup analysis (Table 18). Both effect size estimates are small and positive, but the CIs include both zero and negative values, indicating uncertainty about whether ASCENTS improves GCSE science attainment among FSM pupils.

Additional analyses and robustness checks

Key Stage 2 maths and reading as baseline measure

As outlined in the 'Methods' section, the primary outcome model was re-estimated using Key Stage 2 maths and reading attainment as alternative baseline measures. Unlike Key Stage 2 science attainment, these measures are continuous rather than binary and may therefore, provide a more sensitive indicator of baseline attainment.

When re-estimating the primary model using these alternative baseline measures, the results were consistent with the primary analysis. Using Key Stage 2 maths as the baseline measure, the adjusted difference in means was 0.08 (p = 0.366), with a corresponding effect size of 0.06 (95% CI: -0.09, 0.21). Similarly, when using Key Stage 2 reading attainment as the baseline measure, the adjusted difference in means was 0.07 (p = 0.412), with a corresponding effect size of 0.06 (95% CI: -0.09, 0.21). In both models, the effect sizes were small and positive, but the CIs include both zero and negative values. Taken together, these results suggest that the findings are robust to the choice of baseline measure, but we remain

uncertain whether ASCENTS improves pupils' GCSE science attainment. The full findings are presented in Appendix E (Appendix E Table 1, Appendix E Table 2, Appendix E Table 3, and Appendix E Table 4).

Gender and region

Gender and region were added to the primary outcome model to account for potential variation in science attainment across these factors. The adjusted difference in means was 0.13 (p = 0.155), with a corresponding effect size of 0.10 (95% CI: -0.05, 0.25). This effect size is similar to that observed in the primary analysis (Table 11 and Table 12 above), indicating that the inclusion of gender and region did not change the estimated impact. The full findings are presented in Appendix E (Appendix E Table 5 and Appendix E Table 6).

Imbalance at baseline

Where imbalance was indicated, an additional model including all known pre-treatment characteristics as predictors was estimated as a sensitivity analysis. As presented in the 'Pupil and school characteristics' section above, baseline measures of Key Stage 2 maths and reading attainment indicated imbalance, with both variables showing effect sizes above the 0.05 threshold. These measures were therefore, included as additional covariates in the primary outcome model to assess whether the main primary analysis findings were robust to adjustment for baseline imbalance.

In the sensitivity model, which controlled for baseline Key Stage 2 science attainment and included Key Stage 2 maths and reading attainment as covariates, as well as schools as fixed effects, the adjusted difference in means was 0.07 (p = 0.438). The corresponding Hedges' g effect size was 0.05 (95% CI: -0.10, 0.20), indicating a small positive effect. This is equivalent to one month's additional progress in GCSE science grades. However, as for the primary analysis, the 95% CI includes both zero and negative values, meaning that we are uncertain whether ASCENTS improves pupils' GCSE science attainment. The full findings are presented in Appendix E (Appendix E Table 7 and Appendix E Table 8).

Analysis in the presence of non-compliance

In our initial analysis of non-compliance, we assessed the completeness of the attendance data for pupils allocated to the ASCENTS programme. Of the 374 pupils allocated to the ASCENTS programme across the 57 schools in which NPD consent was provided, the mentoring attendance data showed varying levels of completeness: 267 pupils (71%) had complete data[33]; 64 pupils (17%) had partial data; and 43 pupils (12%) had no attendance data recorded. In total, complete or partial attendance information was available for 331 pupils across 51 schools.

Attendance data for the revision sessions was considerably more limited. Data was recorded for 155 pupils (41%),[34] and only 23 (6%) pupils were recorded as attending at least one of the three-hour revision sessions. Compliance was originally defined as attendance at up to 20 mentoring sessions in addition to participation to a three-hour revision session (maximum 23 points). However, given the extent of missing revision data, including it in the compliance definition would have significantly reduced the number of pupils retained in the analysis sample. To address this, we used only mentoring attendance records, which was reported more consistently than revision session data. We redefined compliance to focus solely on the number of mentoring sessions attended, but only for those pupils with complete mentoring attendance records (i.e. schools confirmed data covering all scheduled sessions). Each pupil was allocated 1 point per mentoring session attended, up to a maximum of 20 points. This score was then rescaled to a range of 0 to 1.

Based on this revised definition, 267 pupils had complete mentoring attendance records, as confirmed by schools. Of these, 17 pupils did not have available data for the primary outcome model. As a result, the CACE analysis included 250 pupils in the intervention group and 350 pupils in the control group.

[33] This count includes pupils with recorded attendance data for every mentoring session across the 20-week intervention period, where teachers recorded whether each pupil attended or did not attend each session.
[34] This count includes pupils with recorded revision session data as well as those where schools confirmed non-attendance or that no revision sessions were scheduled.

Table 19 presents the CACE analysis estimates. The first stage of the CACE analysis regressed the compliance indicator on intervention status. Assignment to the ASCENTS programme was a strong predictor of compliance, with a coefficient of 0.46 (F-statistic = 694.89; p<0.001). The second stage of the analysis found an adjusted difference in means equal to 0.22 (p = 0.306). The associated effect size was 0.16 (95% CI: -0.15, 0.49) which was slightly above that observed for the ITT analysis (0.10, Table 12 above). However, the CI includes both zero and negative values, suggesting that one cannot reject the null hypothesis that ASCENTS had no effect on GCSE science attainment; therefore, there is no conclusive evidence that higher compliance with ASCENTS led to higher GCSE science grades.

Table 19: CACE analysis for the primary outcome

Instrumental variable model	Total n	Predictor	Adjusted difference in means	Effect size (95% CI)	P-value
Stage 1	600	Intervention status	0.46	Not applicable	<0.001
Stage 2	600	Compliance indicator	0.22	0.16 (-0.15, 0 .49)	0.306

Missing data analysis

From randomisation to analysis, there was pupil-level attrition. As shown in Table 9, the primary outcome analysis included 690 of the 839 pupils who were originally randomised, representing an overall attrition rate of 17.76% (18.85% in the intervention group and 16.67% in the control group). Since GCSE science grades and Key Stage 2 science attainment were obtained through linkage to NPD records, pupils (and whole schools) who withdrew from the trial and did not provide consent for their data to be processed or linked in the SRS, could not be included in the missing data analysis, as no outcome or baseline data were available for them.

Among pupils who provided NPD consent, attrition from NPD consent to the analysis sample was 9.80%, which exceeds the commonly accepted threshold of 5% below which patterns of missingness can typically be ignored. In line with the SAP[35], we ran a series of dropout models to explore potential patterns of missingness.

The first step was to estimate a logistic regression model predicting whether the primary outcome (GCSE science attainment) was missing. The model included pupil-level covariates: treatment allocation; gender; eligibility for FSM; and baseline Key Stage 2 maths, English, and science attainment, with missing values replaced by the sample mean. It also included school-level covariates such as school type, region, a rural/urban indicator, the school-level proportion of pupils eligible for FSM, and school-level GCSE attainment, also with missing values replaced by the sample mean.[36]

We then estimated a second dropout model in which the dependent variable was whether the baseline measure used in the primary outcome analysis (Key Stage 2 science attainment) was missing. This model used the same pupil- and school-level covariates listed above, but additionally included GCSE science, English, and maths attainment, with missing values replaced by the sample mean. The coefficients for both dropout model regressions are reported in Appendix F (Appendix F Table 1 and Appendix F Table 2).

Across both dropout models we observed regional patterns in missingness, with certain regions showing a higher probability that the primary outcome and the baseline measure would be missing. Aside from region, none of the pupil- or school-level covariates significantly predicted missingness in either GCSE science attainment or Key Stage 2 science attainment. In line with the SAP, we therefore refitted the primary outcome model including region and compared it with an unadjusted model that included no covariates. The unadjusted model produced a difference in means of 0.14 (p = 0.102), while the adjusted model, which included region, baseline Key Stage 2 science attainment, and school fixed effects, produced a similar difference in means of 0.13 (p = 0.091).

[35] See: https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/ascents-121-support-for-science-2023-24-trial

[36] GCSE attainment refers to two school-level measures: (1) the proportion of pupils achieving a grade 4 ("standard pass"), and (2) the school's Attainment 8 score, a summary measure of average GCSE performance across eight subjects.

As a further robustness check, we conducted a multiple imputation analysis using Stata's *mi* command, which applies a chained equations approach (MICE). The imputation model imputed missing values for Key Stages 2 and 4 science attainment, using a wide set of pupil- and school-level variables, including treatment allocation, school identification (ID), demographic characteristics, and prior attainment measures as predictors to account for missing at random.[37] A total of 100 imputed datasets were generated, and convergence diagnostics indicated stable imputation (see Appendix F Figure 1 and Appendix F Figure 2). The primary outcome model was then re-estimated across the imputed datasets, with the results reported in Table 20 and Table 21. The re-estimated results of the primary analysis remain consistent with the complete case analysis. The adjusted difference in means was 0.14, compared with 0.13 in the complete case analysis (Table 12 above). A similar Hedges' g effect size was also observed (0.10, 95% CI: -0.04, 0.25), which translates to two months' additional progress in GCSE science grades. However, the CI includes zero and negative values, meaning we remain uncertain whether ASCENTS improves GCSE science attainment.

Table 20: Analysis of imputed datasets, by GCSE science attainment

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.14	0.14	354 (37)	1.93	370 (21)	1.84	1.88

Table 21: Analysis of the imputed datasets, by GCSE science attainment effect size estimations

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges' g (95% CI)	P-value
GCSE science	354 (37)	3.76 (3.62, 3.91)	370 (21)	3.62 (3.48, 3.76)	724 (354; 370)	0.10 (-0.04, 0.25)	0.126

[37] The imputation model included treatment allocation and school ID, along with a wider set of auxiliary variables used to inform the imputations: Key Stage 4 English and maths attainment; Key Stage 2 reading attainment; school-level GCSE attainment; gender; FSM eligibility; region; school category; and a rural/urban indicator.

IPE results

The IPE results include mixed views and experiences of how ASCENTS was delivered and participants perceived impact on outcomes. At the recruitment stage, school leads considered ASCENTS an appealing opportunity for their school and the intervention was successful in reaching its intended population of Year 11 pupils from disadvantaged backgrounds. There were key elements of the programme, however, that were not delivered with fidelity. Most notably, these were that mentor–mentee pairings frequently changed, and the Revision Days were not delivered as intended. Additionally, there was variation in the amount and type of ongoing support mentors received. These results suggest a need to refine the logic model so that it is more explicit as to how much variation within delivery is acceptable for programme fidelity.

Mentees and mentors expressed both positive and negative views about their participation in the programme. Those with positive views about ASCENTS tended to emphasise the quality of relationship that they had with their mentor/mentee. Negative views from both mentees and mentors often related to absenteeism and practical challenges such as scheduling conflicts. Mentors and university partners also perceived mentors' pay as too low. Mentor pay rates varied across the universities (hourly rates were set by each university's standard undergraduate pay scales) but this finding was consistent.

The IPE results are limited by high levels of missing attendance data and low survey responses. Table 22 presents the response rates for the pre- and post-intervention IPE surveys. As such, the views and experiences in this section may not be representative of everyone who delivered or participated in ASCENTS.

The IPE did not find any further information about compliance than was already reported in the 'Impact evaluation results' section. Therefore, there is not a section for compliance in this chapter. Findings related to the Revision Days and reasons why they were largely not delivered as intended are discussed in the section below on 'Fidelity'.

Table 22: IPE survey responses

IPE survey respondent group	Pre-intervention (autumn 2023)	Post-intervention (spring/summer 2024)
Mentors	174 out of 341 (51%)	113 out of 341 (33%)
School leads	36 out of 61 (59%)	28 out of 57 (49%)
Mentees	Not applicable	41 out of 374 (11%)
Control pupils	Not applicable	13 out of 391 (3%)

Given the very low response rate for the control pupil survey, these results are reported qualitatively to present the range of views and experiences expressed in the data rather than quantifying them. Responses for the school lead surveys and mentee survey are reported quantitatively; however, we have avoided reporting these results as percentages given the low base figures. Responses for the mentor survey are reported as percentages against bases of 174 and 113 for the pre- and post-intervention surveys, respectively. Respondents were given the option to skip questions or answer 'I don't know'. We have used quotes from open-text survey responses, interviews, and focus group discussions to illustrate IPE findings. Quotes from interviews and focus groups are attributed by participant role in the trial and their serial number in our sample file and quotes from the surveys are attributed by role and which survey the response came from.

Table 23 presents our achieved qualitative sample. Qualitative findings are reported to reflect the views and experiences of participants. The rationale for sample targets is presented in the evaluation protocol and 'Methods' section of this report. Post-intervention fieldwork fell short of our target samples. Participants offered both positive and negative views about participating in ASCENTS and a range of experiences that reflect the variation of how the programme was delivered. It is possible, however, that there will be views and experiences with the programme that are missing from our sample.

The IPE results are organised by the IPE domains and research questions. Findings related to **Context: IPE RQ18. What factors influenced the delivery or impact of ASCENTS?** are integrated into the results rather than having a standalone section.

Table 23: Achieved sample for qualitative IPE fieldwork

Fieldwork activity	Target	Achieved number of encounters
Mentor training observations	3	3
Pre-intervention university partner interview	7	7
Lead developer interview	1	1
Mentoring session observations	5	7
Post-intervention university partner interview	7	5
Post-intervention school lead interviews	7[a]	4
Post-intervention mentor interviews	7	6
Post-intervention mentee focus groups	7 (including 35 – 56 mentees)	5 (including 22 mentees)

[a] *The original protocol stated that we would speak to 14 school leads and 14 mentors post-intervention for 45–60-minute interviews. To enable the interviews to go into greater depth about views and experiences, this was adapted so that we would speak to seven school leads and seven mentors for 45 –60-minute interviews.*

Usual practice

IPE RQ15. What is usual practice and how does ASCENTS differ?

IPE RQ16. To what extent does ASCENTS differ from the NTP?

ASCENTS was intended to be an additional offer that did not replace any existing schools' business as usual support for science. Participating schools offered a range of business as usual science support activities, including mentoring and tutoring, which were available to all pupils during the trial delivery period. The most prominent ways in which ASCENTS differed from business as usual mentoring/tutoring, including the NTP, were that mentoring sessions were delivered one-on-one and by university students. Most business as usual mentoring/tutoring was group-based and delivered by teachers.

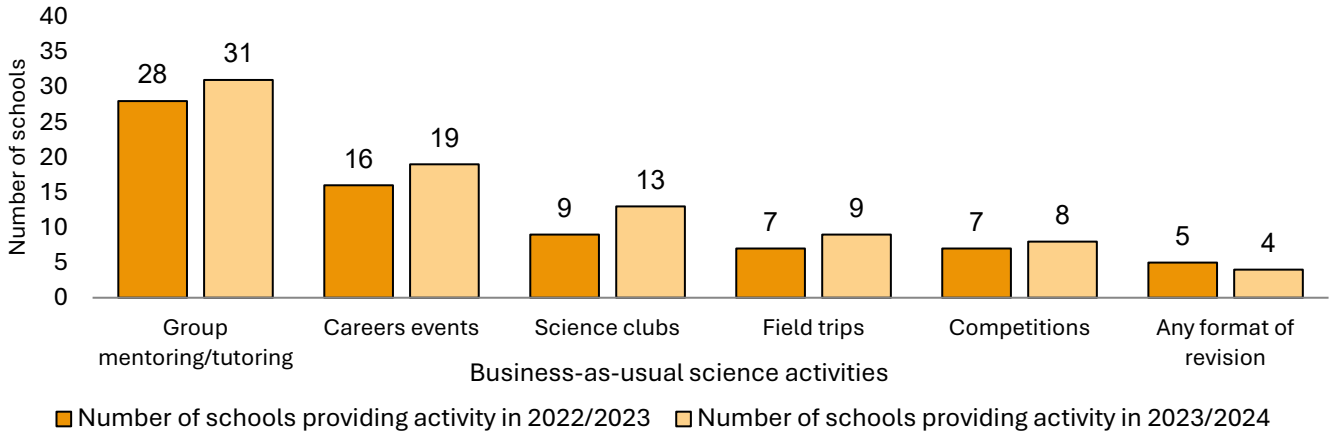
Usual practice

Support for science

Most participating schools provided a variety of support activities for science. These were typically run by teachers and often targeted certain groups of pupils, such as high or low achievers. In the pre-intervention survey, school leads reported that the following science support activities were delivered as business as usual: group mentoring/tutoring, careers events, science clubs, field trips, competitions, and revision sessions. A minority of respondents (n=2 out of 36) said that one-on-one support was offered. Only four school leads (out of 36) who responded to the survey reported either that they did not offer any support for science as business as usual or that they were not sure.

In the pre-intervention survey, most school leads reported that their schools slightly increased their science support for the intervention year (2023/2024) compared to the previous year when ASCENTS was not delivered (2022/2023). The number of schools who did not provide any additional science support, programmes, or activities slightly decreased from ten in 2022/2023 to seven in 2023/2024. This suggests that participating in ASCENTS did not decrease or replace schools' business as usual science support. Figure 9 shows the increase in business as usual science support activities offered during the ASCENTS delivery year. School leads were able to select multiple options. These science support activities were available to ASCENTS mentees as well as pupils in the control group and their participation in them is discussed later in this chapter. Attendance in additional science support activities was not monitored with attendance data provided by schools, but pupils in both the intervention and control groups were asked about their engagement with additional support through surveys.

Figure 9: Business as usual science support for Year 11 pupils in 2022/2023 and 2023/2024



Source: School lead, pre-intervention survey.

Of the schools that provided group mentoring/tutoring for science, nearly half (n=14) offered it to all Year 11 pupils rather than targeting specific pupils. Other schools offered it to specific groups of Year 11 pupils, including medium attaining pupils (n=8), low attaining or underachieving pupils (n=12), high attaining pupils (n=6), pupils eligible for Pupil Premium (n=7), and pupils with SEND (n=4). Note that school leads were able to select more than one response option.

The IPE explored whether ASCENTS mentees and pupils in the control group engaged with business as usual science support during the ASCENTS delivery year. In interviews, school leads reported that pupils' engagement with science support varied, and they tended to see an increase in engagement as exams approached. Less than half (n=18) of the mentee post-intervention survey respondents reported that they participated in business as usual science support, excluding mentoring/tutoring. Mentees were able to select multiple responses to this survey item and reported taking part in science clubs (n=9), field trips (n=3), careers events (n=3), competitions (n=2), volunteering (e.g. at a science event or museum) (n=2), or training (e.g. attending a course outside of normal science teaching) (n=2). Of the remaining mentee post-intervention survey respondents, they either reported that their school did not provide any additional science support (n=4), or that they did not participate in the support on offer (n=8). The post-intervention mentee survey asked a separate question about engagement with business as usual mentoring/tutoring and over a quarter of respondents (n=13) reported that they had received mentoring/tutoring in science outside of ASCENTS. This tended to be delivered weekly by science teachers. Some pupils also received support outside of school from their parents/carers or privately paid tutors. The impact this has on how outcomes can be attributed to ASCENTS is discussed in the 'Conclusion' section.

Pupils who responded to the control group survey reported engagement with fewer business as usual support activities than the mentees. The types of science support activities that control group pupil survey respondents said they participated in were careers events and/or field trips. As previously acknowledged, the response rate for the control group survey was very low and therefore no firm conclusions can be drawn about the extent of nature of this group's engagement with business as usual activities compared to their peers in the intervention group.

Mentoring/tutoring for other subjects

Most school lead pre-intervention survey respondents (n=32) reported that their school provided mentoring/tutoring for Year 11 pupils in subjects other than science, such as English and maths. In interviews, school leads said that support for other subjects included weekly revision sessions, unspecified after-school support, and drop-ins or office hours.

Of the schools who provided non-science mentoring/tutoring, around half (n=17) offered it to all Year 11 pupils, while the other half (n=15) of schools offered it to various specific groups of Year 11 pupils. In interviews, school leads described offering targeted support to pupils based on their social or home life circumstances, for example, young carers or children that have been in care. There is often an overlap with the targeted groups and eligibility for Pupil Premium.

Pupil attendance in mentoring/tutoring varied by subject. Like science support, lead teachers said that engagement would tend to increase as the exam period drew nearer. Support activities for languages and maths were highlighted in school lead interviews as having high attendance.

Over a quarter (n=14) of ASCENTS mentees who responded to the post-intervention survey received mentoring/tutoring for subjects other than science. Respondents of the control group survey also reported taking part in mentoring/tutoring for subjects other than science. Due to sample size limitations, however, we cannot be certain about how common it was for pupils in the control group to take part in mentoring/tutoring. For both groups, these subjects tended to be maths and English. Again, while permitted in the trial design, this has implications for how secondary outcomes can be attributed to ASCENTS.

NTP

In the pre-intervention survey, school leads were asked about pupil participation in the NTP at their school. Approximately a third of the school lead pre-intervention survey respondents (n=13) reported that Year 11 pupils at their school were participating in the NTP during the same academic year that ASCENTS was delivered. Of the schools whose Year 11 pupils were participating in the NTP, the subjects being offered as part of the NTP included maths (n=13), English (n=11), science (n=7), humanities (n=4), or MFL (n=4).

As of the 2023/2024 academic year, schools were allowed to use NTP funding to employ new staff or to support current members of staff to deliver tutoring. Therefore, tutoring/mentoring that school leads reported being delivered in their schools could include the NTP.

Contamination

IPE RQ17. Did ASCENTS mentees share learning from the programme with their peers who did not receive the intervention?

Survey and qualitative data from school leads, mentees, and pupils in the control group suggest that ASCENTS mentees shared learning from the programme with peers who did not take part, including those in the control group. The nature of what was shared, however, is not consistent across reports from school leads, mentees, and pupils in the control group.

Over half (n=19) of the school lead post-intervention survey respondents reported that they were not aware of mentees sharing learning gained in their mentoring sessions with pupils in the control group. Nine respondents to the school lead post-intervention survey reported that they were aware that mentees had shared learning with others and one respondent said that this included pupils in the control group. Over half of the mentees who responded to the mentee survey (n=27) said that they had discussed their ASCENTS mentoring sessions and shared what they had learned with at least one peer who was not taking part in the programme. While control group pupils may be included in these conversations, the survey did not ask mentees to specify whether they were sharing materials with pupils in the control group. Approximately a quarter of mentees (n=9) said they did not talk about ASCENTS with their peers at all, while four respondents could not remember.

Mentees who said that they had shared information and learning with their peers, said that this included general mentions of attending mentoring (n=27), occasional advice or tips from their mentor (n=23), and help with science in a similar way to how their mentor supported them (n=11). In terms of physical materials, 11 mentee survey respondents reported sharing items such as exam booklets, past papers, revision cards, textbooks, worksheets, and notes.

Very few control group pupils reported having conversations with peers who received ASCENTS mentoring. These pupils said that conversations they had were primarily just the fact that the mentee was attending mentoring, however, some reported that they received materials such as exam booklets, past papers, revision cards, textbooks, worksheets, and notes.

Control group attendance

All school lead survey respondents reported that control group pupils at their schools never attended any ASCENTS mentoring sessions. However, there is some evidence of control group pupils attending a small number of ASCENTS

sessions, by exception, from the mentee focus groups. It is unlikely that this would have a meaningful impact on the trial results.

Fidelity

IPE RQ1. Was ASCENTS implemented as planned by universities, schools and mentors?

IPE RQ2. What were the drivers and obstacles to implementation?

In this section, we describe the extent to which ASCENTS was implemented as intended and adaptations that were made during delivery. The IPE found that there was variation in how ASCENTS was implemented across the universities and schools, which affected fidelity. By contrast, the 2019/2020 efficacy trial found a high degree of implementation fidelity and little variation across the school settings (Scandone, 2021). The variation that was seen across delivery in this trial suggests that the logic model should be refined to specify core and flexible components and consider degrees of variation that would be acceptable for programme fidelity and expected impact.

The following programme elements were largely implemented with fidelity, with any adaptations being minor.

- **Recruitment.** Schools, mentors, and mentees all met the intervention's eligibility criteria. University partners and schools made use of available resources within the delivery model, which allowed them to reach their intended audiences.
- **Mentor training.** University partners made minor adaptations to how they delivered training to mentors, such as delivering training partially online or delivering the two-day content over more than two calendar days, however these changes did not compromise the content.
- **Delivery of mentoring sessions.** Most schools were able to accommodate weekly mentoring sessions at school outside of school hours. There are some examples in the data of schools delivering sessions within normal lesson time, but these cases reflect a minority.

There were some programme elements of ASCENTS where variation in delivery affected fidelity.

- **Mentor–mentee pairings changed during delivery.** A large proportion of respondents to the mentor survey (41%, n=46) reported having more than one mentee. While these changes were largely to compensate for absence, which is permitted in the delivery model, the prevalence of pairing changes was greater than what was anticipated. Mentor–mentee pairings were meant to be consistent throughout the programme. Mentees and mentors reported that this had a negative impact on the quality of relationships. Positive mentor–mentee relationships were considered a key mechanism to the programme's outcomes, therefore this aspect of fidelity is particularly important.
- **Mentors received more ongoing support from university partners than intended.** The IPE found that university partners delivered the minimum level of support (one meeting per term) and often exceeded the requirement to provide ongoing support to mentors through one meeting per term. We do not know from the IPE data how much additional support was provided across the university partners; however, varying levels of support can contribute to inconsistent quality of mentoring practice. While the protocol did not specify a maximum level of support, such variation can, in turn, affect the quality and consistency of mentoring practice.
- **Revision Days were not delivered as intended.** Most schools did not support their students to attend a Revision Day at the university due to scheduling conflicts and transportation challenges. Two universities hosted a Revision Day on their campus. The approach to Revision Days was adapted to accommodate three-hour revision sessions at schools, however the uptake of this was also low. Revision Day attendance data was provided for 40% of the mentees and of those, 6% attended a Revision Day either at their local partner university or a three-hour revision session at their school.

Recruitment

Participants (schools, mentors, and mentees) were largely recruited with fidelity. Eligibility criteria were followed as were the intended strategies for reaching eligible schools, university students, and pupils.

School recruitment

School recruitment was implemented as intended. Universities used various methods to recruit schools, including: university outreach departments; utilisation of school contacts; local marketing campaigns through email and social media; and face-to-face visits. Interested schools had to meet the following eligibility criteria: be a non-selective state school in England; be in the vicinity of a university partner; and not already be running an intensive science mentoring or tutoring programme for Year 11 pupils.

School recruitment was most straightforward when the university partners had existing relationships with schools who met the eligibility criteria. Participation in the previous trial was considered an advantage to recruitment as these schools had an existing, positive impression of ASCENTS leading them to be more accommodating of the onboarding paperwork, which some university partners described as burdensome.

ASCENTS was appealing to schools because it was perceived as fitting within schools' aims for their pupils eligible for Pupil Premium. In interviews, school leads described ambitions for these pupils to have access to high-quality opportunities and resources without affordability being a barrier to engagement. Furthermore, schools hoped that connecting with university undergraduates would give them valuable insight into what university is like and increase their aspirations for further studies.

There were two elements which acted as barriers to school recruitment. First, the programme's set-up paperwork was considered burdensome, and university partners fed back that schools would disengage if they could not commit to completing it. Second, university partners said in interviews that some schools were not comfortable with the trial conditions meaning that pupils randomised into the control group would not receive ASCENTS.

Mentor recruitment

Universities implemented mentor recruitment processes as intended. Most mentor pre-intervention survey respondents first heard about ASCENTS either through email (60%, n=104), their university's job board or website (21%, n=37), or at a class, lecture, or seminar (13%, n=23). Universities also used additional methods of recruitment such as posters, calls, social media, in-person drop-in sessions, and communication channels from other university departments (e.g. various science departments, widening participation, careers, etc.).

Most 78% (n=135) of the mentors who responded to the pre-intervention survey described the application process as 'very easy' or 'slightly easy'.

Barriers to mentor recruitment included the offer not being financially attractive to potential mentors (two hours of pay per session) combined with the requirement to travel to schools.

Mentee recruitment

Mentee recruitment was delivered with fidelity. For mentee recruitment, schools were required to identify eligible pupils and obtain their parent/carer's permission to participate, including consent for trial data collection.

The protocol did not prescribe a specific method for contacting parents/carers. Table 24 shows the methods schools used to recruit eligible pupils and to promote the programme to their parents/carers. The most common recruitment method schools used was distributing the pupil and parent/carer letters provided by NatCen and their partner university followed by emails pupils and parents/carers and arranging meetings with pupils.

Table 24: Recruitment activities schools used to recruit pupils and to promote to parents/carers of eligible pupils

Recruitment activities	No. of schools using recruitment activities for pupils	No. of schools using recruitment activities for parents/carers
Provided pupil or parent/carer letters	35	35
School created letters, fliers, or leaflets	9	9
Emails	25	26
Telephone calls (parents/carers only)	N/A	19

Recruitment activities	No. of schools using recruitment activities for pupils	No. of schools using recruitment activities for parents/carers
Posters displayed in the school (pupil only)	1	0
Text messages	8	7
Introduction events or presentations (pupil only)	3	N/A
Mentioned during lessons or assemblies (pupils only)	9	N/A
Individual face-to-face recruitment	26	4
Parents/carers evening (parents/carers only)	N/A	4

Source: School lead, pre-intervention survey.
N/A=not applicable.

Positive engagement with parents/carers was a key driver of mentee recruitment. Many of the recruitment challenges discussed in school lead and university partner interviews related to activities with parents/carers. In interviews, school leads and university partners said that parents/carers had found information about the programme to be unclear or confusing. School leads also felt that they could not fully address parents/carers' concerns or confusion within the short recruitment time frame. These challenges were amplified in cases where parents/carers spoke English as a second language or had low levels of literacy.

University partners highlighted the importance of parents/carers' understanding that the trial conditions meant that there was a possibility that their child may be allocated to the control group but still be participating in the trial by their NPD being used and being invited to take part in the control pupil survey.

The main challenges for mentee recruitment that school leads reported in the pre-intervention survey were:

- lack of pupil interest (n=27);
- difficulties in receiving permission slips from parents/carers (n=20);
- lack of parents/carers interest in the programme (n=19); and
- difficulties in communicating with parents/carers (n=12).

Training and ongoing support

Mentor training was largely delivered with fidelity. The core training content was covered as intended, and safeguarding sessions led by the developer were delivered as intended. Adjustments to timing and format, such as spreading training over more than two days or using mixed in-person and online delivery, feedback from the university partners and mentors suggest that these changes did not compromise learning outcomes.

Ongoing support for mentors often exceeded the required one meeting per term with the university partner.

Mentor training

Mentors were required to attend two days of in-person training at their university before the mentoring sessions began, as well as a separate safeguarding session at their assigned school delivered by the headteacher or the school's safeguarding lead. The content of the first day of training included administrative and procedural aspects including safeguarding and DBS paperwork. The second training day focused on mentoring practice, GCSE and subject expectations, as well as the context of mentoring Pupil Premium students. The lead developer was required to deliver identical in-person safeguarding training at each university. This was implemented with fidelity. The content was fully delivered and adaptations to the mode and format were within the tailoring boundaries for the programme and did not compromise the learning outcomes.

Adaptations included delivering the content over more than two calendar days and sometimes through mixed in-person and online delivery. In interviews, university partners described holding additional training sessions or catch-up sessions for mentors who were recruited late or as replacements for dropouts.

There is not enough evidence to determine whether the school-specific safeguarding sessions took place consistently across universities.

Ongoing support for mentors

Mentors were required to attend one meeting per term with their university partner. University partners reported that ongoing support for mentors often exceeded this requirement. The delivery protocol did not provide guidance about how much additional support would be acceptable to provide within the programme design and budget, which has implications for programme fidelity. Types and levels of support varied across the universities. This suggests that one meeting per term was not a sufficient level of support for mentors.

In the pre-intervention interviews, university partners shared that they had approaches in place to provide more ongoing support than the required termly meeting. University partners discussed providing mentors with additional resources and regular online communication and check ins. For example, some university partners produced handbooks with the training content, logistical information, and resources for mentors to refer to. Many university partners discussed maintaining open lines of communication and support by holding drop-in sessions, emailing mentors, and setting up Microsoft Teams channels and/or WhatsApp groups. In addition to using these channels to provide mentoring support, university partners used them to check in with mentors, communicate updates, and share logistical information. This finding suggests that the amount and nature of support should be specified in the logic model and include guidance for tailoring that support to mentors' needs and preferred communication channels.

Mentor–mentee pairings

Mentors and mentees were paired by the university partners based on availability. The positive influence that high-quality mentor–mentee relationships had on experiences with ASCENTS is discussed in the section below on 'Responsiveness'. Stability of mentor–mentee pairings are a core element of the programme and therefore, a particularly important aspect to be delivered with fidelity.

In interviews, university partners reported that it was difficult to match timetables between mentees and mentors. Additionally, carrying out randomisation in two batches had a knock-on impact on allocations. A final challenge in allocating mentor–mentee pairings was that there were more mentees recruited to the programme than mentors. In response to this, there were cases where mentors were allocated multiple mentees within the same school.

Mentor–mentee pairings should not have changed throughout the programme unless there were extenuating circumstances, such as mentors dropping out. Mentees were allowed to work in a triad group with another mentor–mentee pair if their mentor was absent. Both mentor and mentee absence and attrition meant that pairings often changed, and this negatively impacted the quality of relationships between mentors and mentees. A large proportion (41%, n=46) of mentor post-intervention survey respondents reported that they had different mentees since starting ASCENTS, while over a quarter of mentee survey respondents (n=15) reported that they had more than one mentor since starting ASCENTS.

Of mentor survey respondents who reported having more than one mentee, overlapping reasons were:

- that their mentee could not go to some of the sessions (n=24);
- their mentee dropped out of ASCENTS (n=16);
- they were allocated more than one mentee (n=13);
- they changed schools due to scheduling issues (n=5); or
- they covered for another mentor who was unable to attend (n=5).

Under half (n=15) of the mentees who responded to the post-intervention survey reported that they had more than one mentor. Of those mentees, nine reported having a substitute mentor cover for their regular mentor being absent. Five mentees said that their mentor dropped out of ASCENTS. Finally, one mentee changed mentors because their originally assigned mentor was not helpful.

During the delivery period, the lead developer introduced measures to address mentor absenteeism. First, to incentivise attendance, it was greed with the EEF that mentors could be paid for the session time even if their mentee did not show up for the session. These payments could be made for up to three consecutive occasions and if absence extended beyond that,

the mentee was withdrawn from the programme (unless these was a justifiable reason, such as illness). Second, reserve mentors were made available to fill in for mentors who were absent, however this was rare. More often, the approach would be for a mentor to take on a second mentee.

For mentees, the relationship that they built up with their mentor was a key factor in supporting engagement. In focus groups, mentees reported they were less likely to drop out of ASCENTS when they had built up a positive relationship with their mentor.

Mentoring sessions

Due to missing attendance data, it is not possible to make a full assessment of the extent that the number of sessions were delivered or attended as intended. This is discussed in the section below on 'Dosage'. However, the IPE did find evidence that mentoring session format and content was delivered with fidelity. Sessions were held face-to-face in mentees' schools, and they were supervised by a qualified teacher or other suitably qualified adult. They were held for one hour, and any late starts or early finishes were to accommodate lateness and or a requirement for the mentee or mentor to leave early.

School lead post-intervention survey respondents said that most schools (n=22) held sessions outside of school hours as intended, while a minority (n=6) held sessions during lesson time. Of the schools who held sessions outside of school hours, almost all (n=21) were held after school. During focus groups, mentees did report occasions of missing other lessons to take part in ASCENTS, which was not intended in the programme design. Mentees who placed a high priority on science, did not express concern about missing other subjects. However, there was an occasion where a mentee expressed concern because they missed lesson time relevant to their Physical Education GCSE. The IPE results do now allow us to interpret the scale at which this occurred throughout the programme.

Most ASCENTS sessions were held in a classroom, and under half of the lead teachers (n=10) said that sessions were held in locations such as a library or computer room. Sessions were supervised by a school staff member as intended. School leads who responded to the post-intervention survey said that the staff members who supervised ASCENTS sessions included science teachers (n=22), teaching assistants/learning support assistants (n=7), or other staff members (n=5).

The content of ASCENTS sessions mainly focused on science classwork and homework, rather than GCSE-specific content. Mentors who responded to the post-intervention survey said the most common content covered in mentoring sessions included science classwork (84%, n=96), improving confidence (61%, n=70), learning strategies (61%, n=70), science homework (43%, n=49), and career options (21%, n=24). Mentors could select more than one response, and therefore there is overlap in these responses. Feedback from school leads on the content of mentoring sessions was largely positive. In interviews, school leads said that mentors were knowledgeable about relevant topics, prepared for their sessions, and were able to explain concepts to mentees in an accessible, engaging way.

Views on the quality of mentoring sessions were not wholly positive, however. In interviews, some school leads said that mentors did not arrive with resources or a plan. These views, may in part, be due to a misunderstanding of the invention as mentors were not required to attend sessions with a plan, but rather they were meant to support mentees with questions presented during the sessions. A university partner had also received feedback from some teachers where they expressed concern about the quality of teaching within the mentoring sessions.

A high-quality mentor–mentee relationship was a key driver of success in mentoring sessions. Additionally, mentor flexibility was a driver for meaningful mentoring sessions so that mentors were able to use the time available to best support their mentee. In the mentee survey open-text responses and focus group discussions, mentees often discussed these aspects as being positive features of their mentoring sessions.

> *I really enjoyed my time with my mentor. I loved the 1-2-1 support I was getting and how my mentor made sure everything made sense for me. Having a mentor to teach me alone was way easier than learning in a classroom environment and over time I started to create a bond with my mentor which definitely contributed to my attitude to the programme as a whole and the way I was able to learn from them. My mentor was really kind and she explained things in ways that I could understand. She adapted her teaching to suit the way I learned and it helped SO much!* (Mentee survey response)

Barriers to delivering mentoring sessions were experienced by schools, mentors, and mentees, and while they were often not insurmountable, they did impact morale on the programme and are, therefore, discussed in more detail in the section below on 'Responsiveness'.

Revision Days

Revision Days were set out in the ASCENTS protocol as a six-hour day scheduled before GCSE exams and hosted at the university. Revision Days were intended to summarise the mentoring sessions, prepare mentees for upcoming GCSE exams, and expose mentees to the university environment. The Revision Days had to include three-hour GCSE science revision sessions. In addition to the three-hour GCSE revision sessions, mentees were to be offered additional STEM-related activities on campus. Revision Days were not implemented with fidelity. Two universities hosted an on-campus Revision Day. Schools had the option to host revision sessions at the school if it was not possible to attend a Revision Day at the university. Twelve schools opted for this format of the Revision Day.

Just over half (n=16) of school lead post-intervention survey respondents reported that their school took part in an ASCENTS Revision Day in any form: either three hours at their school (n=12); or four schools attending a Revision Day held at a university (n=4).

The content of the Revision Days held at universities was delivered as intended; however, delivery deviated from the protocol in that the university covered the transportation costs for schools. This encouraged the schools to support their mentees to attend the Revision Day.

Of the schools that had Revision Days at their school, school leads felt that staff had more availability to run or supervise the sessions than they would have if they had had to travel to a university campus. The two universities that were able to host a Revision Day on campus felt that timing it to be before the Easter holidays worked well because teachers were more likely to get approval to leave school with pupils than after Easter during exam periods.

Nearly half of the school lead post-intervention survey respondents (n=12) reported that their school did not take part in an ASCENTS Revision Day in any form. These respondents identified several practical barriers discussed below.

Logistical challenges

University partners, school leads, and the lead developer all shared a view in their respective interviews that Revision Days did not take place because of logistical challenges, such as timetabling issues, lack of available staff to supervise, and lack of coordination with the university/mentors. They also suggested that the proposed date was too close to schools' exam period when their own revision activity had to be prioritised. In the post-intervention school lead survey, respondents who did not take part in a Revision Day said that logistical challenges included timetabling issues (n=7), a lack of available staff to supervise (n=4), and a lack of coordination with the university/mentors (n=2).

Lack of support from school leadership

In interviews, university partners and school leads said that members of SLT thought the Revision Day was a good idea in principle, however, they could not support it because it would take away from revision for higher-prioritised subjects like maths and English. School lead post-intervention survey respondents also reported that a lack of support from their school's SLT (n=2) was a reason for why they did not attend a Revision Day at their local university or hold a Revision Day at their school.

> *We had to do some gentle negotiating to say, 'Actually, you've signed up for this. This was agreed. This is something they're entitled to. You should see it as a benefit...'* (University partner 4, Post-intervention interview)

Lack of funding for travel

In interviews, university partner interviews and the lead developer interview said that the lack of funding for schools' transportation to Revision Days negatively impacted the organisation and delivery of Revision Days. As mentioned above in this section, one university partner that held a Revision Day at their campus deviated from the protocol to cover the transportation costs for the schools.

> *…we had hoped that some of the universities might have contributed as part of their outreach to the cost of a bus …it just didn't work out that way.* (Lead developer, Post-intervention interview)

Reach

IPE RQ5. Did the intervention reach its intended population?

IPE RQ6. Are there patterns in terms of pupil characteristics?

The ASCENTS intervention reached its intended population of schools, mentors, and pupils. The 'Impact evaluation results' section on 'Pupil and school characteristics' subsection presents descriptive statistics of the population of schools and pupils who engaged with ASCENTS.

In the pre-intervention school lead survey, school leads were asked about the eligible student population at their school. Survey responses from school leads indicated a wide range in the number of Year 11 pupils eligible for Pupil Premium per school, from as few as six to as many as 80, with the majority of schools (n=33) having 45 or fewer eligible pupils. Most schools invited all eligible pupils to take part, and a small number of schools (n=3) chose to target specific pupils within the eligible population. One reason for this was a concern that pupils already receiving additional support for other subjects might be overloaded. At randomisation, all pupils who were randomised were confirmed as eligible for Pupil Premium, and nearly all received Pupil Premium (99%, n=828). Most of the pupils that were randomised were also eligible for FSM (84%, n=641). There were more females than males recruited to the programme, with 449 females and 389 males at randomisation.

All mentors who responded to the mentor survey and/or took part in an interview met the eligibility criteria set out in the subsection on 'Participant selection' in the 'Methods' section. Mentors came from a range of science disciplines, including computer science, biological sciences, pharmacology, zoology/biology, sport and exercise science, and medicine. Many mentors expressed an interest in teaching, with some considering it a potential career path.

Dosage

IPE RQ3. How many sessions did mentors attend / pupils receive?

IPE RQ4. What was the amount of time spent delivering the sessions?

Due to high levels of missing attendance data, we are limited in the extent to which we can evaluate session attendance. After accounting for withdrawals, a total of 57 schools and 374 pupils participated in the ASCENTS programme. Mentoring session attendance records were completed for 267 pupils (71%), partially completed for 64 pupils (17%), and not recorded for 43 pupils (12%) over the 20-week intervention period, indicating a substantial proportion of incomplete or missing data. We asked about session delivery and attendance in the school lead surveys, post-intervention mentor survey, and post-intervention mentee survey so that dosage could be evaluated by multiple data sources.

There was also a high level of missing data for Revision Day attendance. Data were recorded for 155 mentees (41%), and just 23 mentees (6%) were recorded as attending a Revision Day in any form (university hosted or at school).

Session delivery and attendance

Session delivery

Nearly half (n=12) of the school leads who responded to the post-intervention survey could not report the exact number of mentoring sessions delivered. Of the school leads who did report the number of sessions completed: three reported that

all 23 sessions occurred; two reported 21 sessions or 22 sessions occurred; five reported 19 to 20 sessions occurred; three reported that 12 to 16 sessions occurred; and three reported that 3 to 11 sessions occurred.

Mentor attendance

In the post-intervention survey, mentors who did not drop out of ASCENTS (n=88) were asked about session absence. Of the mentors who missed sessions (but did not dropout of the programme), most mentors reported missing between one and three sessions (35%, n=30) or between four and six sessions (38%, n=33).

Of the 24% (n=26) of mentors who stopped mentoring before the end of the programme, most attended fewer than ten sessions (n=12) and a minority attended more than 20 sessions (n=4).

Mentee attendance

The number of required sessions was reduced from 23 to 20. The logic model does not suggest a minimum number of sessions for the intervention to be effective, so it is assumed that mentees would attend all sessions. We recommend that this is something the developer considers for future delivery and evaluation.

Complete or partial attendance information was available for 331 pupils across 51 schools. Among pupils with complete attendance data (n=267), the average number of sessions attended was nine, with attendance ranging from 0 to 20 sessions scheduled. It was most common for mentee post-intervention survey respondents to miss between one and three sessions (n=31), and a minority (n=4) missed between four and six sessions. Only a minority of mentee survey respondents (n=4) reported that they did not miss any mentoring sessions. This aligns with accounts from mentor and school lead interviews, as well as mentee focus groups, about varied levels of mentee attendance.

Cross-tabulation analysis of the mentee survey data explored whether there were any differences in attendance patterns between male and female mentees. Around 13 male mentees and 25 female mentees responded to the mentee survey question about attendance. Higher absence (missing three or more sessions) was more common among female mentees (n=12) than with male mentees (n=3). Both genders displayed similar patterns for moderate session absence (missing one or two sessions) and it was more common among female mentees (n=12) than male mentees (n=7). In total, half of respondents (19 pupils out of 38) fell into this range.

Duration of mentoring sessions

Almost all (n=26) school lead post-intervention survey respondents reported that the mentoring sessions at their school were one hour in length, as outlined in the delivery protocol. However, data from observations and mentor interviews shows that sessions at times started late and/or ended early, particularly if mentees had other commitments or were not interested in attending the full session.

Responsiveness

This section explores the degree to which mentors and mentees engaged with the ASCENTS programme, including their preparation, delivery, attendance, and perceptions of the mentoring experience. Findings are drawn from surveys, interviews, focus groups, and observations, and highlight the factors that supported or hindered engagement.

Mentors and mentees shared positive and negative views and experiences of taking part in ASCENTS. Mentors were generally well-prepared for sessions, felt commitment to the mentoring sessions, and felt that the programme was valuable, however, they found mentee absenteeism, low pay, and logistical challenges difficult to manage. Similarly, mentees reported that they enjoyed the mentoring sessions and that they found them engaging and useful, however, they also experienced challenges with mentor absenteeism. Furthermore, they did not always feel motivated to attend sessions. A clear finding related to responsiveness is that the positive, stable relationships between mentors and mentees were key factors to enhancing engagement with ASCENTS.

Mentor responsiveness

IPE RQ7. How engaged were mentors with the processes of preparations, delivery and follow-ups?

IPE RQ8. How did mentors feel about the programme?

IPE RQ9. What were the perceived costs and benefits of being an ASCENTS mentor?

IPE RQ10. What were the drivers / obstacles to mentors' engagement?[38]

When reflecting on their experience with the programme, mentors had both positive and negative views of ASCENTS. Positive views were related to feelings of satisfaction that came from helping others and outcomes they felt they had achieved for themselves or supported their mentee to achieve. They also reflected on the quality of relationship with their mentee being a key driver to their satisfaction with the programme. Negative views were around perceived low pay and frustrations with mentee absenteeism.

Positive views

Appeal of taking part in ASCENTS

Mentors recognised opportunities in taking part in ASCENTS, which motivated them to apply to the programme. The following factors were considered *'extremely important'* to mentor respondents to the pre-intervention survey when deciding to take part in ASCENTS:

- supporting the learning of disadvantaged students (24%, n=42);
- earning money while studying (24%, n=42);
- thinking it was important to help young people do well in STEM (20%, n=35);
- strengthening their CV to help secure a job after university (20%, n=34);
- learning what it is like to work with young people (13%, n=22); and
- supporting the local area (10%, n=18).

Helping others and empathy

In the post-intervention survey, 88% (n=99) of mentors reported feeling good about helping each other through ASCENTS. Related to this, in interviews, mentors shared that ASCENTS helped them develop skills such as teamwork and communication, especially with young people from lower socio-economic backgrounds. Mentors also gained a better understanding of the barriers to education that people face.

> *That's not just economic barriers, but emotional or psychological barriers. Also just understanding different teaching and learning styles.* (Mentor 6)

Positive relationships

Findings from interviews with mentors suggest that a key driver for mentor engagement was positive relationships with their mentees. In interviews, mentors expressed excitement about seeing their mentees weekly. Some mentors described feeling rewarded when mentees remembered their advice and tips, which they felt helped reduce mentees' exam anxiety.

> *I feel like I really connected with her and that we had built such a good friendship*. (Mentor 2)

In the post-intervention mentor survey, over half 64% (n=72) of respondents liked socialising with other mentors. This was also reflected in mentor interviews. They found that ASCENTS was an opportunity to meet mentors with similar values and interests. However, other mentors found it challenging to socialise. In interviews, they described conversations with other mentors often ending quickly, making it hard to form connections. Some mentors said that they did not socialise outside of

[38] For example: prior attainment of mentors, gender pairing, distance between mentors' home and school, age of the mentor, etc.

sessions because they were from different courses and universities and, therefore, were unlikely to encounter each other elsewhere.

Outcomes

Mentors recognised improvements in outcomes such as confidence, time management, and scientific knowledge. These are discussed in detail in the section below on 'Wider outcomes'.

Negative views

Low pay

Mentors felt that pay was insufficient for the time involved for participating in ASCENTS. Two hours per session was meant to cover the mentoring session, preparation and follow-up, and travel time. Mentors and university partners both fed back in interviews that they often spent more than two hours per session, mainly due to travelling to and from sessions. Mentors' frustration with low pay was amplified when mentees would not attend and they would therefore, not get paid for that session. For some this meant they were paid less than the minimum wage when taking into consideration travel time which varied between mentors. University partners compared mentors being paid per session to a 'zero hours contract'. They were paid for the session if they had travelled to the school and the mentee did not turn up, however, if a mentee cancelled before the session, they would not get paid for the session.

> *[Mentors] were unhappy that if the mentee cancelled, even on the day, they didn't get paid. It felt precarious to them…the argument they put forward was that if they knew they wouldn't do the mentoring, they would do some other job.* (University partner 1, Post-intervention interview)

Commuting

Some mentors lived a considerable distance from the schools they were allocated. In these cases, mentors disliked travelling to and from ASCENTS sessions. In the mentor post-intervention survey, ten open-text responses referred to travel as a negative part of ASCENTS. In interviews, some mentors described having to commute 45 minutes to an hour from the university to the schools. Some mentors said that they reduced their mentoring sessions towards the end of the programme so that they only provided mentoring at schools that were convenient to travel to. They made these choices to make more time available for other commitments such as exams and placements.

Managing absenteeism

In the post-intervention survey, 35% (n=40) of mentors referred to poor communication about mentee absenteeism as something they disliked about ASCENTS. In interviews, mentors said they sometimes found out their mentee was absent and/or were required to cover another mentee just 30 minutes before the session. Mentors also described occasions of there being sessions with only one mentee and two mentors, or one mentor and multiple mentees due to either mentors or mentees being absent. They suggested that mentors should be informed that a mentee was absent before they began their travel to schools. In the post-intervention survey, of the mentors who said they stopped mentoring before the ASCENTS programme finished (24%, n=27), over half (n=14) cited mentee absenteeism as a reason.

Balancing mentoring with other commitments

Some mentors found balancing ASCENTS with university work challenging. In the mentor post-intervention survey, over half (n=15) of the 27 mentors who dropped out of ASCENTS gave clashes with lectures and other university commitments as reasons). In interviews, mentors reported spending more time on ASCENTS than anticipated, which meant they had less time for other activities including paid work, volunteering, student ambassador roles, and studying. Additionally, when asked about the costs/disadvantages of taking part in ASCENTS in the post-intervention survey, a number of mentors felt that they had to reduce their study time (33.9%, n=38) and spend less time socialising (26%, n=29) to make time for ASCENTS.

Preparation, delivery, and follow-up

Training and resources

Mentors reported feeling prepared for mentoring. This was attributed to the training and additional resources that university partners provided. Most of the pre-intervention mentor survey respondents (94%, n=163) were satisfied with the people who delivered the training. Most respondents to the mentor pre-intervention survey (89%, n=154) reported feeling an increase in confidence after the training. The remaining felt neutral (10%, n=18) or not confident (1%, n=1). Mentors fed back that the people delivering the training provided clear guidance and answered questions in detail, which helped mentors understand their responsibilities. One mentor reflected in a post-intervention interview that:

> *They genuinely did actually help me out with teaching*. (Mentor 1)

Others commented that the content, which covered mentoring theory and practice as an approach to support pupils to better understand GCSE content and arrive at answers for themselves was particularly valuable.

> *You're trying to help them find the answer, but without us actually doing it, and making them do it on their own, but aiding them. So that explanation was pretty useful.* (Mentor 3)

> *I think it really gets you to think a bit more beyond surface level about what you're doing things, and knowing about there's like a philosophy to these things. (*Mentor 6)

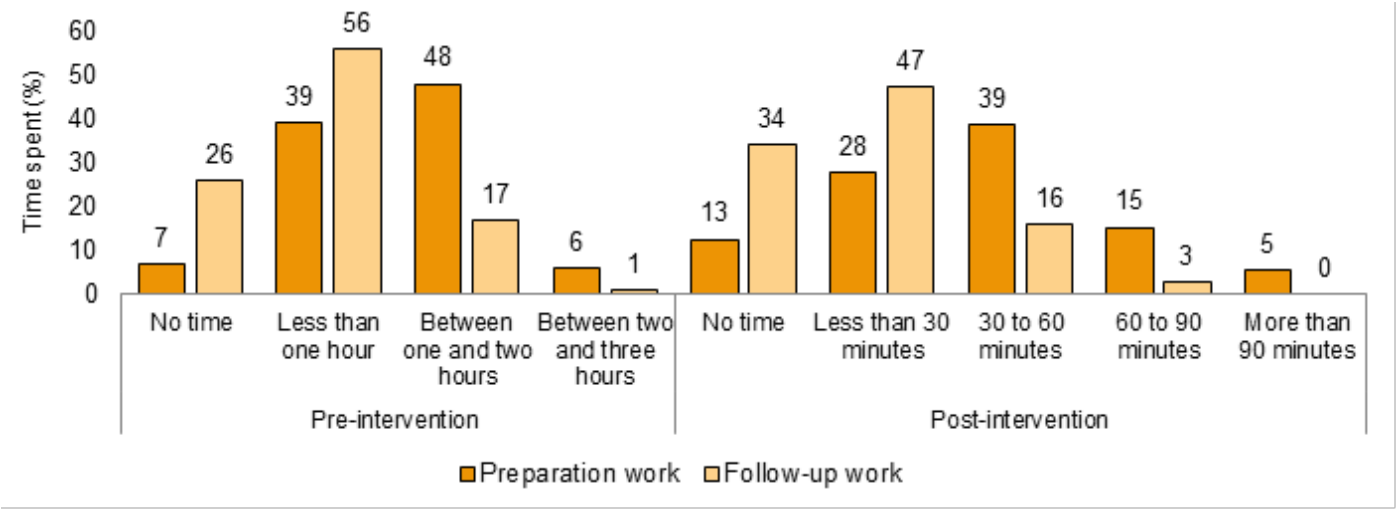
An area where mentors felt the training fell short was in GCSE content. In interviews, mentors mentioned the training did not cover up-to-date GCSE content, which they found concerning. In interviews, mentors suggested adding more topics to the training and in the mentee survey, when asked for areas for improvement as an open response question, three mentees suggested that mentors receive more training on GCSE science content. This feedback from mentors aligns with the feedback a university partner received from teachers, and relayed to us an interview, where they expressed concerns about the quality of teaching and content provided in mentoring sessions.

Mentors valued the safeguarding training. When asked about the safeguarding training in the mentor pre-intervention survey, 97% (n=168) of respondents were satisfied with safeguarding trainers. In interviews, mentors reported that they appreciated the practical scenarios used in the safeguarding training, and some mentors described using the knowledge in real-life situations.

Preparation and follow-up for mentoring sessions

Mentors were not explicitly required to do preparation and follow-up work for mentoring sessions nor were they expected to provide materials. We did, however, explore whether this occurred through the IPE. In the pre-intervention survey, mentors anticipated that they would need more preparation and follow-up time for mentoring sessions than the time they reported in the post-intervention survey (see Figure 10 below). The post-intervention survey found that most mentors spent 30 to 60 minutes (38%, n=43) or less than 30 minutes (27%, n=31) preparing for mentoring sessions. Nearly half (44%, n=50) spent less than 30 minutes on follow-up work, and 32% (n=36) reported doing no follow-up work.

Figure 10: Mentors expected and actual time spent preparing and completing follow-up work



Source: Mentor pre- and post-intervention surveys.

According to mentor interviews, their preparation work involved creating study plans focused on GCSE topics, making revision sheets, and assembling materials, such as calculators, for mentees to use. In interviews, some mentors said that they enjoyed preparing for sessions, particularly in cases when they felt that their mentee was equally as committed to the mentoring sessions. Mentors liked learning about their mentees' strengths, weaknesses, and study preferences and considering how to best support mentees.

School staff also helped with mentor preparation. In interviews, mentors described school staff providing information such as current topics, mock exams, and updates on changes in the mentee's academic set,[39] which they found helpful.

Follow-up activities, albeit limited, included reviewing pupil progress, preparing revision materials, and communicating with school staff. In mentor interviews and mentee focus groups, both mentees and mentors said that mentors did not often assign homework, which was an optional component of the programme. Some did, however, suggest additional resources for their mentee and work with their mentees to create revision timetables to support their independent study.

Delivery

Mentors actively engaged with their mentees during ASCENTS sessions. During session observations, the evaluation team observed mentors asking their mentees questions and explaining concepts in a way that created a supportive learning environment. Mentors used encouraging language and referred to previous sessions so to support mentees learning.

Communication with staff was minimal and occurred only when mentors and mentees had difficulties understanding certain topics. According to interviews with school leads, mentors, and observations, these interactions happened when both the mentor and mentee needed extra support to grasp specific concepts.

In interviews, mentors recognised the value proactively building a good relationship with their mentees.

> *If you develop a good connection then the [pupils] will see you less as an alien really and they will share more with you than if you didn't have a good connection with them.* (Mentor 3)

The IPE explored whether age and gender played a role in mentor–mentee relationships and mentors had mixed views on these aspects. In the post-intervention mentor survey, 42% (n=47) said that they had a mentee who was a different gender to their own and for the majority of those (n=45) this did not impact their experience with ASCENTS.

However, some mentors believed that having a mentee of the same gender positively influenced their relationship. In the post-intervention survey, 56% mentors (n=64) said that they had a mentee who was the same gender as themselves and

[39] An academic set is a group of students who are grouped together by ability in a specific subject.

around a third (n=21) of these mentors reported that they liked this, whereas the remaining (n=43) said that the same gender pairing did not make a difference. For example, one male mentor described feeling more comfortable with a male mentee. They reported this allowed them to set boundaries and enhance their ability to teach during mentoring sessions.

In interviews, mentors described the small age gap between themselves and their mentors as helpful for allowing them to understand their mentees' feelings about school. It also increased the mentees' trust in their mentors because they viewed them more as role models. This understanding and trust enhanced the mentoring.

Mentee responsiveness

IPE RQ11. How engaged were mentees in preparing for, attending and following up on mentoring sessions?

IPE RQ12. What were the perceived costs and benefits of participating in ASCENTS? What did mentees learn?

IPE RQ13. How did mentees feel about mentoring sessions?

IPE RQ14. What were the drivers / obstacles to mentees' engagement?[40]

Most (n=33) mentees who responded to the mentee post-intervention survey reported a positive experience. They described a range of benefits to taking part in the programme, such as improved confidence, increased understanding of science, greater motivation in other subjects, and stronger aspirations for further study or careers in science. Pupils also valued the one-on-one format, personalised support, and relationships built with mentors. Some mentees, however, expressed frustration with session timing, mentor absenteeism, and stigma associated with participation. Some mentees disliked having to switch mentors or share sessions with other pupils, which disrupted rapport and reduced engagement. A minority also found the rooms too noisy or crowded, and some felt sessions lacked structure when mentors were unprepared.

Mentors reported that mentees who attended sessions were engaged. School leads also reported that they observed mentees being engaged in sessions. Mentors reflected that they felt that mentee engagement increased over time as they became more comfortable in the sessions.

Positive views

<u>One-on-one mentee-led support</u>

Mentees appreciated the one-on-one delivery mode of ASCENTS. When asked about what they enjoyed about the ASCENTS mentoring sessions in the mentee survey, just over a quarter (n=11) of respondents wrote about this aspect in open-text responses. Mentees felt the one-on-one mentoring allowed them to go through problems at a pace that worked for them in a more relaxed environment than a classroom.

In focus group discussions, mentees said that they valued the ability to choose the content in their sessions and said that the one-on-one nature of the sessions made it easier for mentees to ask questions. With only the mentee and mentor present, mentees felt that they could focus entirely on their needs without distractions.

> *Because it was more personalised…so, it was just easier to focus on what I needed to focus on.* (Mentee, Focus group 2)

<u>Relationship with their mentor</u>

Those who had positive relationships with their mentors, enjoyed the relationships they developed. Over half of the respondents to the mentee post-intervention survey (n=23) 'strongly agreed' that they got on well with their mentor. Some mentees viewed their mentors as role models, describing them in the focus groups as '*smart*' and '*cool'*. Initial introductions at the beginning of the programme, where mentors shared their background in STEM and previous mentoring

[40] For example, gender pairing, prior attainment of mentees, whether attended final Revision Day.

experience, helped mentees feel comfortable. This openness from mentors and attempts to build rapport encouraged mentees to ask questions freely.

Most respondents (n=18) to the mentee post-intervention survey 'strongly agreed' that they felt their mentor cared about them. Mentors engaged in normal conversations with mentees about their day and home life and making topics '*sound so much easier'*. These types of interactions helped mentors understand mentees' strengths and weaknesses, fostering an overall positive relationship.

> *The reason we worked so well with her [mentor] is because she wasn't like just so serious, she like talked to us and like worked with us. Well, had chats with us while we was doing our work.* (Mentee, Focus group 4)

Most respondents to the mentee post-intervention survey (n=23) 'strongly agreed' they felt comfortable going to their mentor with questions about science, and they often attributed this to the relationship and rapport they had with their mentor. Mentees in focus groups also described mentors as less intimidating than teachers.

> *They just like actually try and help you. Having banter so you don't worry about getting a question wrong. Casual relationship means you feel more comfortable getting a question wrong and you know they will help you.* (Mentee, Focus group 2)

Mentees who responded to the mentee survey had similar views about gender differences as mentors. In the mentee survey, 21 mentees said that their mentor was a different gender to them and the majority (n=20) said that that did not matter to their experience. Around 16 mentees reported that their mentor was the same gender as them and over half (n=9) of those mentees said that this did not make a difference to their experience, while the others (n=7) reported that they liked having a mentor who was the same gender as them.

Both mentees and school leads fed back that the age gap between mentees and mentors being smaller than the age gap between mentees and teachers was positive. School leads believed mentors being slightly older made interactions less intimidating for mentees.

<u>Quality of mentor tuition</u>

Mentees appreciated their mentors' ability to explain science content effectively. In the mentee survey, most (n=36) respondents 'agreed' or 'strongly agreed' that their mentor explained things in a way that helped them understand.

In focus groups, mentees with previous mentoring/tutoring experience said ASCENTS had more interaction than traditional tutoring. This casual interaction with mentors helped mentors understand the mentees' strengths and weaknesses better.

> *You actually do feel a change and an impact in what you learn when you go over stuff.* (Mentee, Focus group 1)

In focus groups, mentees shared that mentors used creative methods to help them understand science content. Mentees appreciated these varied teaching approaches, finding them helpful for learning GCSE content.

> *I can learn them a bit different or faster, so they stay in my memory for the exams.* (Mentee, Focus group 4)

Negative views

<u>Mentor absenteeism</u>

Mentees disliked inconsistent attendance from mentors and having different mentors during the delivery period. According to the mentee post-intervention survey, just over half of mentee post-intervention survey respondents had the same mentor for the duration of the programme (n=25), while around a third reported having had more than one mentor (n=15). Of the mentees who reported having more than one mentor, the main reasons were that they had a different mentor when their regular one was unavailable (n=9), or their original mentor dropped out of ASCENTS (n=5).

Around 15 mentees provided open-text responses when asked what they did not like about ASCENTS and four of those mentioned mentor absenteeism or having different mentors.

When mentors were absent, mentees would often be paired up with a different mentor. In focus groups, mentees shared that this negatively impacted engagement. Mentees described feeling awkward and disengaged with their mentor when they returned to sessions after missing several weeks in a row. When mentors were absent, mentees would sometimes share a mentor, disrupting the usual one-on-one dynamic. In focus groups, mentees reported feeling more distracted and '*chatty*' when paired with another mentee.

In addition to enjoying the relational benefits of stable pairings, mentees also felt that they were more effective for learning.

> *For obvious reasons the same person may not be able to attend each session but it was much better when I had the same mentor every session as they knew where we was at and could test me on what we previously had learned together.* (Mentee survey)

Session timing and location

Mentees often disliked the timing of the mentoring sessions, which were determined by schools. While the programme specified that sessions should be held either before or after school, most of them were after school. In the mentee survey and in focus groups, mentees said that they were often tired after school and did not feel motivated to attend. School leads also recognised this.

One suggestion that mentees offered was to hold sessions closer to exam dates, for instance, having sessions three weeks before the exams, when mentees thought the support would be most needed.

Although most respondents to the mentee post-intervention survey (n=38) reported no problems with the room where sessions took place, a few found the room was too noisy (n=3), too crowded (n=3), and/or too hot (n=3). In focus groups, some mentees suggested having mentors and mentees in separate rooms from other pairs, to minimise distraction from other pairings.

Preparation, attendance, and follow-up

Mentees reported that they did not typically spend much time preparing for ASCENTS sessions or doing follow-up work. The programme design and logic model does not set specific expectations for preparation, follow-up time, or tasks. Half of the respondents to the mentee post-intervention survey (n=19) did not prepare for sessions. Of those who did prepare (n=15), most spent less than 30 minutes preparing (n=13).

In the mentee survey and in focus groups, mentees reported mixed experiences of how much they engaged with follow-up work that their mentor recommended, however, those who did, said that it was helpful and manageable.

Attendance

Mentees gave several reasons for missing sessions in the post-intervention survey, and over the course of a 20-week delivery period it is not unreasonable to expect that some sessions would be missed. Reasons for missing sessions included illness (n=15), clashes with other activities (n=14), and mentor absences (n=10). The timing of the sessions after school was also a factor. Others would skip sessions because of competing priorities, such as having part-time jobs.

> *Being honest, sometimes I'd had forgotten that I'd had it on the day that I had it (Monday), and be kind of annoyed as I wanted to go home.* (Mentee survey)

Another reason for not attending was because of the stigma associated with ASCENTS. In interviews, school leads described mentees feeling embarrassed about attending sessions because they felt that they had been recruited to the programme because they were at risk of not passing their exams. As these views came from qualitative interviews, we cannot quantify how prevalent these experiences were.

Wider outcomes

IPE RQ19. What is the perceived effect of ASCENTS mentoring programme on classroom dynamics?

IPE RQ20. What are the perceived effects on schools and teachers?

IPE RQ21. How did ASCENTS influence mentors' choices about further study and / or career plans?

IPE RQ22. What are the drivers and obstacles to positive outcomes?

IPE RQ23. Is ASCENTS attractive for universities and schools to take-up and deliver?

The IPE explored the perceived wider outcomes of ASCENTS for mentees, mentors, schools, and universities.

Drivers and obstacles for positive outcomes are presented in the section above on 'Responsiveness'.

Outcomes for mentees

Participants identified four key outcomes that they believed ASCENTS could have on mentees, though evidence on the extent that they were realised is mixed. These were: improving pupils' understanding and confidence in science; increasing their interest in science; improving pupils' engagement in lessons; and raising their overall aspirations.

Improved understanding and confidence in science

In the mentee survey, most (n=32) respondents either 'agreed' or 'strongly agreed' that ASCENTS improved their understanding of science topics, with a minority (n=2) 'disagreeing' or 'strongly disagreeing' with the statement. Half (n=21) 'agreed' or 'strongly agreed' that ASCENTS mentoring had boosted their motivation in other subjects, whereas 13 respondents neither 'agreed' nor 'disagreed' with the statement, and six respondents either 'disagreed' or 'strongly disagreed'.

Furthermore, most respondents to the mentee post-intervention survey (n=37) thought that they would achieve their predicted GCSE science grade or higher. Most respondents to the post-intervention control group survey also anticipated achieving their predicted score or higher.

Mixed evidence of increased interest in science

While the responses to the survey suggest that ASCENTS increased mentees' confidence with science and understanding of scientific concepts, evidence of whether the programme influenced their interest in science is more mixed. Half of the respondents (n=18) 'agreed' or 'strongly agreed' that ASCENTS increased their interest in science, with the remaining mentees neither 'agreed' nor 'disagreed' (n=13) or 'disagreed'/'strongly disagreed' (n=8).

While half 'agreed' or 'strongly agreed' that ASCENTS increased their interest in science, fewer mentees reported an increased interest in further study or a career in science. Over half of the mentees who responded to the post-intervention survey (n=23) said that they were either 'unlikely' or 'very unlikely' to study science after GCSEs. Of the remaining, eight mentees said that they were either 'likely' or 'very likely' and ten mentees said that they were 'neither likely' nor 'unlikely' to study science after GCSEs. Mentees were also asked whether ASCENTS influenced their likelihood to study science after GCSEs. Under half of the mentees who responded to the post-intervention survey (n=15) 'agreed' or 'strongly agreed' that participating in ASCENTS had made them more likely to study science after GCSE exams. Half of the mentees who responded to the post-intervention 'might' (n=20) be interested in doing a job involving the sciences as a career, while four mentees said that they were 'definitely' interested in doing a job involving the sciences. This survey question did ask mentees to consider whether ASCENTS influenced their interest in a career in science. Of these, female respondents (n=17) were more likely than male respondents (n=6) to express an interest in a future job involving science.

We asked pupils in the control group about their interest in pursuing science after GCSEs and about their interest in a career in science. Due to the small number of responses to the control group survey, we could not do a true comparison of ambition to pursue further education or careers in science between the two groups, however, pupils in the control group reported mixed views on whether they would pursue science after GCSEs or as a career. The similar views in both groups

suggest that ASCENTS might not have an impact on long-term educational or career aspirations in science; however, we will examine longer-term educational outcomes in a follow-up study using NPD data to explore the impact of ASCENTS on pupils' progression to A levels.

Improved engagement in lessons

In interviews, school leads recognised an increased willingness from mentees to participate in lessons and answer questions.

> *Because they were able to talk through areas that they were struggling with, and [go] back into the classroom, having sorted those out, [that] would have made them a lot more positive and more engaged.* (School lead 3, Post-intervention interview)

Focus groups with mentees echoed these findings, as participants discussed how they felt more confident, willing, and able to answer questions in exams since participating in ASCENTS. Mentees in focus groups also described feeling capable of achieving better grades after receiving ASCENTS mentoring.

> *...told her what topics I struggle on and now that I understand them, I feel confident answering more questions.* (Mentee, Focus group 2)

> *...it's making us feel better in our lessons about ourselves and our knowledge of the science.* (Mentee, Focus group 5)

In post-intervention interviews, school leads also discussed mentees positively influencing other pupils by sharing their learnings, raising aspirations, and encouraging more class participation.

Higher pupil aspirations

Findings from the post-implementation mentee survey found mixed evidence related to pupils' aspirations post-secondary school. Most mentees who responded to the survey reported that they either 'definitely' (n=13) or 'might' (n=18) want to go to university. Similarly, most of the control group survey respondents also reported that they either 'definitely' or 'might' want to go to university, however, the response rate for this survey was too low for us to meaningfully be able to quantify these views.

In interviews and the post-intervention survey, school leads discussed how ASCENTS strengthened links with local universities and fostered closer relationships between mentors and pupils. In qualitative interviews, school leads discussed ASCENTS mentoring positively impacting the school environment by raising pupils' aspirations for further study.

> *Some of our [pupils] don't know anybody else in their family who's been to university, and I think they have misconceptions that it's not for them, so [...] opening their eyes to opportunities, that's just going to help raise aspirations.* (School lead 2, Post-intervention interview)

Six respondents to the post-intervention school lead survey referred to closer relationships with the local university as a benefit of ASCENTS in open-text response.

> *It made them start thinking about revision and preparation. Gave [pupils] motivation for further education and looking to the future.* (School lead survey respondent 14, Post-intervention survey)

Outcomes for mentors

In the post-intervention mentor survey, key benefits to taking part in the programme that they reported were improved confidence and time management. Views were more varied regarding the programme's influence on university attainment and sense of local belonging. We conducted cross-tabulation analysis to explore the relationship between reported outcomes and factors such as their overall experience on the programme, time spent on preparation and follow-up work, and mentors' relationships with their mentees.

Improved confidence

Of those who completed the mentor post-intervention survey, 75% (n= 85) said that their confidence improved after taking part in ASCENTS. Mentors with positive and negative experiences of ASCENTS were both likely to report improvements in confidence. Cross-tabulation analysis showed that 86% (n=59) of mentors who reported having a good experience with ASCENTS mentoring (n=69) had also said that their confidence improved. Of the mentors who described their experience on the ASCENTS programme as 'okay' (n=36), most (n=24) said that they had experienced improved confidence. Of the few mentors who reported having a 'bad' ASCENTS mentoring experience (n=8), under half reported improved confidence (n=2).

Mentors who participated in post-intervention interviews described this sense of improved confidence in two ways. One way was in relation to delivering the mentoring sessions and the other was in relation to their future.

> *I definitely felt like by the end of it, I felt a lot better about my confidence in delivering things, in explaining things, in communicating really well.* (Mentor 4)

> *I feel more equipped for my future having more skills to rely on. I have more doors opening up for my future. I feel like I can make more use of my skills in different areas of life.* (Mentor 54)

Time management

In the post-intervention mentor survey, 54% (n=61) of mentors indicated that their time management skills had improved from participating in ASCENTS.

In addition to the one hour of time spent mentoring, mentors were paid for one hour that was expected to cover their time for preparation and follow-up work. We explored the relationship between time spent on preparation and follow-up work with reported improvements in time management to explore whether mentors who spent more or less time on ASCENTS delivery experienced any differences in this outcome. Cross-tabulation analysis found that mentors who had reported spending more time on preparation and follow-up work for mentoring sessions were more likely to report improvements in time management than those who spent less than 30 minutes on session preparation and follow-up. Of the respondents who spent more than 30 minutes preparing for sessions (n=54), most (n=39) reported improved time management, compared to just over half (n=22) out of the 39 respondents who spent less than 30 minutes preparing. Similarly, of the 61 mentors who engaged in follow-up work after sessions, most (n=44) reported improvements in time management. Of the 30 respondents who reported that they did not engage in any follow-up work, half (n=15) reported improvements in time management.

Similarly, cross-tabulation analysis found that mentors who had a positive experience with the programme were also more likely to report improvements in time management. Of the 69 mentors who reported having a 'good' experience, 64% (n=44) reported improvements in their time management, compared to around half (17 of 36) of the mentors who reported having an 'okay' experience.

Impact on university attainment

Most mentors who responded to the survey did not report improvements in university attainment or were unsure if this was impacted. Of those that responded to the mentor post-intervention survey, 52% (n=59) reported no improvement in their academic performance, while a further 19% (n=22) said that they were unsure. Only 21% (n=24) felt their attainment had improved.

Mentors who reported having a good overall experience with ASCENTS and stronger relationships with their mentees were more likely to report academic improvements. Of the mentors who reported improved university attainment (n=24), most (n=18) also reported having a 'good' experience, and a minority who reported having an 'okay' (n=4) or 'bad' experience (n=2). Additionally, almost all (n=22) mentors who reported improved university attainment said that they 'got on well' with their mentee.

Sense of belonging in their local area

Mentors' sense of belonging in the local area showed mixed results. In the post-intervention mentor survey, 36% (n=41) reported an increased sense of belonging in the local area as being a benefit of taking part in ASCENTS. Mentors were more likely to report feeling an increased sense of belonging in their local area if they had had a positive experience with ASCENTS

overall. Of mentors who reported having a 'good' experience with ASCENTS mentoring (n=69) in the post-intervention survey, 45% (n=31) also expressed an increased sense of belonging. Of mentors who had expressed having an 'okay' experience (n =36), just under a quarter (n=8) also expressed an increased sense of belonging. Few mentors reported having a 'bad' experience with ASCENTS (n=8), and a quarter of those (n=2) reported that they felt an increased sense of belonging in their local area.

Mentors who got on well with their mentees were slightly more likely to report increased belonging. Of the mentors who reported feeling an increased sense of belonging (n=39), all 'strongly agreed' (n=23) or 'agreed' (n=16) that they got on well with their mentee.

Outcomes for schools and teachers

In interviews and post-intervention surveys, school leads reported both benefits and disadvantages in taking part in ASCENTS. Most (n=23) of the respondents to the post-intervention school lead survey said that that they would recommend ASCENTS to others. Even so, in open-text responses and interviews, school leads expressed disadvantages to taking part and opportunities to improve the programme.

Many school leads spoke positively about benefits for mentees and these findings are presented in the section on 'Outcomes for mentees' above.

Staff workload

Increased staff workloads were considered a disadvantage of taking part, with some teachers describing the experience of delivering it as stressful. This was also reflected in the school lead interviews.

Over half (n=15) of the respondents to the post-intervention school lead survey submitted open-text responses when asked about disadvantages of taking part in ASCENTS and most (n=13) of them referred to increased workload. While some respondents reported a minor increase, others described the programme as burdensome. Logistical challenges were frequently cited as a key factor contributing to the increased workload. The timing of mentoring sessions often required staff to work outside their usual hours. In the cases where they were held during lesson time, led to students missing timetabled lessons or other opportunities, though we do not have evidence to suggest that this issue was widespread across the schools. These views were reinforced in interviews, where logistical complexity was consistently mentioned as a source of strain on staff. In interviews with school leads, the most cited drawback of the ASCENTS programme was the additional workload it placed on teachers and school staff. This included responsibilities such as ensuring mentors and mentees had the necessary resources, co-ordinating student attendance, and supervising mentoring sessions.

> *The weekly demand on the ASCENTS lead was too much—ensuring that pupils were informed and chasing them to attend, ensuring we had someone to supervise the sessions etc.* (School lead survey respondent 24, Post-intervention survey)

While most school leads described ASCENTS as adding to staff workload, a few saw benefits. They explained that mentoring sessions freed up teachers to focus on other pupils. This suggests that the impact on workload was not uniform and depended on how schools organised mentoring within their timetable.

Within-school relationships and learning environments

Participants expressed primarily positive views on the impact ASCENTS had on learning environments and within-school relationships, though respondents did share negative views and experiences as well.

In interviews and open-text survey responses, lead teachers shared examples of pupils being not only engaged in mentoring sessions, but also more engaged in their classes. School leads reported that as students became more focused and engaged, teachers spent less time managing classroom behaviour and more time on individual support, marking, and lesson planning. These improvements were seen as a positive outcome of the mentoring programme, with staff feeling encouraged and motivated by the visible benefits to students. Seeing engaged pupils boosted and watching the mentors become positive role models increased staff morale.

> *Reminded staff what a positive learning environment can achieve. Boosted morale to see students so actively engaged.* (School lead survey respondent 22, Post-intervention survey)

In interviews, school leads described perceptions of improved relationships between teachers and mentees. They shared a general perception that mentees, being pleased to have been selected for ASCENTS, in turn were more engaged with teachers and lessons. Lead teachers also made observations of teachers and mentees talking to each other in the hallway more than before ASCENTS. However, a minority of participants reported that the programme had negatively affected relationships within the school. There were concerns about stigma, associated with the programme, as it was targeted at students at risk of not passing their science GCSEs. This stigma, which was characterised as a concern from mentees about what their teachers and peers thought of them, led to reluctance among some students to participate, with reports of students avoiding sessions and staff.

Experiences of universities

In interviews, university partners described ASCENTS as often enjoyable and rewarding. University partners highlighted the positive feedback they received from school leads and felt that they were making a tangible difference to mentees. This sense of impact was especially important during more stressful phases, such as the initial set-up. Taking part in a trial was also a motivating factor for the university partners.

One university partner reflected:

> *It's science-based, which, for me personally, although I teach science every week, this is really the kind of research, making a difference to children in our region if we can, that we would want to be involved in.* (University partner 2, Pre-intervention interview)

Another manager shared that when the project concluded and partners were asked if they would participate again in a similar initiative, the response was overwhelmingly positive and without hesitation, suggesting a clear recognition of the programme's value.

Not all experiences were positive, however. In post-intervention interviews, several university partners described the delivery of ASCENTS as time consuming and stressful. They spoke of working *'on a knife edge'* and struggling to balance various aspects of the project. Challenges included needing more senior staff involvement than anticipated, lacking capacity to manage mentor recruitment fluctuations, and feeling inadequate when comparing their institution's performance to others, particularly when mentors would dropout.

One manager described the strain on staff:

> *...all the staff we have supporting us. Our entire [human resources] HR team have been involved. Honestly, there was a point in September where if I walked into a room, people were just like, 'Please don't talk to me about science mentors anymore...'* (University partner 6, Pre-intervention interview)

In post-intervention interviews, university partners often expressed that ASCENTS delivery did not live up to its potential. In cases where programme uptake or feedback fell below expectations, such as when sessions were missed by mentees or mentors or cancelled by schools at short notice, university partners expressed disappointment and a sense of dejection. These experiences made delivering the programme feel less rewarding than when delivery was running smoothly.

Cost

In both pre- and post-interviews, university partners shared that they anticipated the costs of the ASCENTS to be high when the amount of time that was required for recruitment, administration, and support was factored in. The IPE found that university partners perceived that they were working above the time that they were allocated to deliver ASCENTS. Table 25 and Table 26 below summarise the added costs associated with delivering ASCENTS incurred by schools (compared to usual teaching practice) and by the delivery team, respectively. For schools, the activities covered represent the added effort or time of implementing the programme over and above teachers' usual responsibilities. Following the EEF guidance (EEF, 2023) and the 'Ingredients method' (Levin *et al.,* 2018), we have presented the following cost categories, including personnel costs for:

- preparations for programme delivery (schools and delivery team);
- training for implementation of the programme (delivery team); and
- implementation of the programme (schools and delivery team).

We have also included facilities, equipment, and materials required for implementation.

We acknowledge the EEF's guidance to cover costs estimated for the programme as it was implemented in this evaluation (EEF, 2023). The study experienced limited uptake of the Revision Day and a high level of missing data for the Revision Day. Out of 28 post-intervention school surveys completed, only four schools indicated that they took part in a full-day Revision Day at a university, as originally intended. As suggested in the EEF's guidance (EEF, 2023), we report costs associated both with and without the Revision Day. However, the headline figure for the programme implementation costs is based on how the programme was actually implemented in the study.

Financial data

Schools provided details on the time spent on ASCENTS activities, such as time spent on planning and supervising mentoring sessions (Table 25). Time spent on recruiting pupils to the ASCENTS programme was considered as recurring cost as new cohort of pupils would need to be recruited each academic year. The personnel costs for preparing the programme delivery and the implementation of the programme were considered as recurring costs as these activities are needed each year of the programme implementation. No start-up costs and pre-requisites for schools were identified.

Table 25: Time of delivering ASCENTS, by schools

Category	Item	Type of cost	Mean no. of hours
Personnel costs for preparing programme delivery	Time spent on recruiting pupils to the ASCENTS programme	Recurring cost	4.6 hours
Personnel costs for preparing programme delivery	Time spent on planning for the mentoring sessions	Recurring cost	13 hours
Personnel costs for the implementation of the programme	Time spent on supervising the mentoring sessions	Recurring cost	17 hours
Personnel costs for preparing programme delivery	Time spent on planning for the Revision Day	Recurring cost	2.5 hours
Personnel costs for the implementation of the programme	Time spent on attending the Revision Day	Recurring cost	8.5 hours

Table 25 shows the mean amount of time spent on different activities as reported by schools (n=28 schools) which completed the cost survey. The average number of pupils who were randomly allocated to the ASCENTS programme was 6.54 pupils per school. Only one year of the programme is presented in Table 25, as all these activities were considered 'recurring' activities, thus schools could expect to spend a similar amount of time to implement ASCENTS for any academic year.

Please note that our IPE findings indicate that the programme was time intensive, and that some costs were insufficient for the amount of time involved to deliver the programme. For example, teachers and university partners reported that they needed more resources than they had anticipated to manage the programme, particularly when recruitment was challenging and there were logistical issues around mentoring sessions. In some instances, these increased staff workloads, leading them to work beyond their core hours. Therefore, schools may need to consider the extent to which they will need to factor in the cost of staff cover to facilitate the ASCENTS programme.

The delivery team provided details on the financial cost of implementing the ASCENTS programme (Table 26). The following categories of recurring costs were collected from the delivery team for the initial stage of ASCENTS: materials for mentors and facilities for ASCENTS activities; onboarding mentors to the programme; and training mentors.[41] Costs associated with mentor travel, mentor salaries, and monitoring mentoring sessions were considered recurring costs as they would be repeated each year of the implementation. Additionally, costs associated with planning and delivering (including materials and facilities needed) the Revision Day were considered recurring costs. No pre-requisites and start-up costs for the delivery team were identified.

We assumed that administrative assistants would undertake tasks, such as onboarding mentors and monitoring mentoring sessions, while the university lecturers would undertake tasks like training mentors and attending the Revision Day. To translate the time spent by the delivery team into a monetary estimate, we assumed the average hourly salary of £12 for administrative assistants[42] and £22 for lecturers[43]. Furthermore, per-pupil cost estimates were based on the number of pupils randomised into the ASCENTS programme at universities where the delivery partners completed the cost survey. A total of 363 pupils were randomly allocated to mentoring with mentors at these universities.

Overall, Table 26 below shows that the per pupil per year cost of delivering ASCENTS is £609.90 (including the Revision Day) or £596.30 (excluding the Revision Day). ASCENTS is therefore, deemed to be a moderate cost programme (see Appendix A).

Table 26: Cost of delivering ASCENTS, by delivery costs

Category	Item	Type of cost	Total no. of hours, where relevant	Total cost	Total cost over three years	Total cost per pupil per year
Facilities, equipment, and materials for implementation	Cost of materials for mentors and facilities for ASCENTS activities	Recurring cost	Not applicable	£2,260	£6,780	
Personnel costs for preparing programme delivery	Time spent on recruiting mentors and schools to the ASCENTS programme	Recurring cost	1,522 hours	£18,264	£54,792	
Personnel costs for preparing programme delivery	Cost of carrying out DBS checks for mentors	Recurring cost	Not applicable	£11,093	£33,279	
Personnel costs during training for implementation of the programme	Time spent on preparing and delivering training to the mentors	Recurring cost	272 hours	£5,984	£17,952	

[41] Please note that we made a conservative assumption that a new cohort of mentors would need to be recruited each year. Therefore, the costs for the initial stage of ASCENTS were categorised as recurring cost. There is potential for savings on these costs if some of the mentors remain in the programme and continue mentoring.
[42] We assumed an average yearly salary of £24,960 for administrative assistants, based on a 40-hour work week, totalling 2,080 hours per year.
[43] We assumed an average yearly salary of £45,760 for university lecturers, based on a 40-hour work week, totalling 2,080 hours per year.

Category	Item	Type of cost	Total no. of hours, where relevant	Total cost	Total cost over three years	Total cost per pupil per year
Personnel costs for the implementation of the programme	Cost of travel for mentors	Recurring cost	Not applicable	£24,135.50	£72,406.50	
Personnel costs for the implementation of the programme	Time spent on monitoring the mentoring sessions	Recurring cost	1,891 hours	£22,692	£68,076	
Personnel costs for the implementation of the programme	Cost of mentor salaries	Recurring cost	Not applicable	£132,700	£398,100	
Personnel costs for preparing programme delivery	Time spent on planning the Revision Day	Recurring cost	157 hours	£1,884	£5,652	
Personnel costs for the implementation of the programme	Time spent on attending the Revision Day	Recurring cost	49 hours	£1,078	£3,234	
Facilities, equipment, and materials for implementation	Cost of materials and facilities for the Revision Day	Recurring cost	Not applicable	£1,980	£5,940	
	Total without the Revision Day				£649,385.50	£596.30
	Total with the Revision Day				£664,211.50	£609.90

Table 27: Cumulative costs of ASCENTS (assuming delivery over three years)

Programme	Year one	Year two	Year three
ASCENTS	£221,403.80	£221,403.80	£221,403.80

Conclusion

The efficacy trial of ASCENTS did not provide conclusive evidence of a positive impact on the primary or secondary outcomes. The IPE found pockets of implementation as intended, however, logistical challenges and absenteeism affected delivery. As such, the programme was delivered with moderate fidelity and participants had varying experiences with ASCENTS. This evaluation has not found evidence that the intervention is ready to scale to an effectiveness trial. Key conclusions are presented below in Table 28.

The evaluation findings are limited by high levels of missing attendance data and low response rates for the IPE surveys. The conclusions that we are presenting in this report are based on the available evidence and may not reflect all participants' experiences. In addition to making recommendations to refine the logic model, we have also considered improvements to the evaluation design to reduce contamination, encourage survey response rates, and increase attendance data completeness.

Table 28: Key conclusions

Key conclusions	
1.	Pupils allocated to receive ASCENTS made, on average, two additional months' progress in science attainment compared to pupils receiving business as usual science provision. This result has a moderate to high security rating.
2.	Pupils allocated to receive ASCENTS made, on average, one additional month's progress in maths attainment compared to pupils receiving business as usual science provision. For English attainment, pupils allocated to receive ASCENTS made, on average, no additional month's progress compared to pupils receiving business as usual science provision.
3.	For mentees and mentors who reported positive experiences with ASCENTS, high-quality relationships and good rapport were considered key factors, which influenced positive engagement and perceived outcomes. Negative views from both mentees and mentors often related to absenteeism resulting in unstable mentor–mentee pairings and practical challenges of taking part in the programme.
4.	University partners and school leads considered ASCENTS to be an appealing offer, but also burdensome to deliver. It was challenging to deliver the programme with fidelity. Most notably, mentor–mentee pairings often changed, Revision Days were not delivered as intended, and the amount of ongoing support that mentees were offered by university partners varied.

Impact evaluation and IPE integration

Results from the impact evaluation found that pupils eligible for Pupil Premium receiving ASCENTS made two months' additional progress in GCSE science attainment compared to pupils in the control group. However, the range of possible impacts for ASCENTS includes small negative effects of one month's less progress, no effect and positive effects of up to three months' progress. This trial, therefore, cannot conclude that ASCENTS improved pupils' GCSE science attainment.

Pupils receiving ASCENTS made one month's additional progress in GCSE maths attainment, with possible impacts ranging between small negative effects of two months' less progress and positive effects of up to three months' progress. Furthermore, pupils receiving ASCENTS made no additional month's progress in GCSE English attainment, with possible impacts ranging between negative effects of two months' less progress and positive effects of up to two months' progress. As is the case for GCSE science attainment, this trial cannot conclude that ASCENTS improved pupils' GCSE maths and English attainment.

It is possible that delivery challenges, which affected implementation fidelity, have diminished the programme's impact. Most notably, these include a large proportion of mentor–mentee pairings changing and Revision Days not being delivered as intended. There was evidence, however, of many programme elements being delivered as intended and positive feedback from school leads, mentors, and mentees. Benefits of taking part in the programme were most commonly reported in cases where mentor–mentee pairs were stable and a positive relationship had developed.

The results of this evaluation partially align with the existing evidence of the effects of mentoring on academic outcomes. The literature suggests that mentoring can have a small positive impact on attainment outcomes and is most effective when

there is a high-quality relationship between the mentor and mentee. Evidence in the EEF Teaching and Learning Toolkit[44] demonstrates that mentoring can improve attainment by two or more months' additional progress. The impact evaluation also found evidence of ASCENTS mentees experiencing two months' additional progress for science attainment, however, the estimated range of effects included zero (no impacts) as well as small negative and small positive values. The DuBois *et al.* (2002) meta-analysis of youth mentoring found that there was a modest or small benefit of programme participation on academic performance, and slightly stronger effects were found for those from disadvantaged backgrounds. The meta-analysis also found that programme effects were enhanced when strong relationships are formed between mentors and mentees. Relatedly, the EEF Teaching and Learning Toolkit[45] includes evidence that mentees can experience negative impacts if their mentor drops out of the programme. The IPE found that both mentee and mentors reported that the mentoring sessions were more effective when they had the same mentor. It could be argued, then, that ASCENTS' impact may have been diminished by mentee and mentor absenteeism and dropouts, which resulted in a large proportion of mentor–mentee pairings changing during the delivery period.

The IPE did not find evidence that mentees were more likely to study science after GCSEs after taking part in ASCENTS. This will be tested in a longitudinal follow-up study with the results published in 2027.

Outcomes for mentors were mixed. While some reported that their experience of mentoring through ASCENTS had increased their aspirations for a career in teaching, others said that it did not make a difference to this outcome. This will be tested in the longitudinal follow-up study that will be published in spring 2029.

The 2019/2020 ASCENTS IPE found more promising results relating to implementation and perceived benefits than this evaluation. As such, while we do not recommend that ASCENTS progress on the EEF pipeline to an effectiveness trial, another efficacy trial could be justified if the delivery model is refined to increase the feasibility of delivering ASCENTS with fidelity.

Evidence to support the logic model

Positive relationships are a key driver for engagement and outcomes

Both mentees and mentors who experienced consistent and positive mentor–mentee relationships were more likely to report positive experiences with the programme as a whole and recognise the benefits of taking part. Similarly, school leads reported that observing mentor–mentee relationships develop, and seeing the benefits of those relationships, made participating in the programme rewarding. This aligns with the literature on effective mentoring and highlights the importance in addressing both mentor and mentee absenteeism.

The appeal of ASCENTS

ASCENTS was largely considered appealing to schools, mentors, and pupils. While there were challenges with recruitment and additional resources required to achieve the required participation for the trial, the intervention did successfully engage the required number of eligible participants. Schools perceived the offer as additional support alongside their business as usual science provision without causing unnecessary duplication or interference. Equally, mentors perceived the programme as an opportunity to support young people while developing skills and experience that would further their own academic and career goals. While the programme was appealing for schools to sign up to, the reality of delivering the programme was considered challenging and the IPE found evidence that schools found it burdensome.

Unintended consequences

The IPE found evidence of unintended consequences, both positive and negative, of the intervention. Some of these were included in the logic model, whereas others emerged from the evaluation data.

Stigma associated with taking part in the programme

[44] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit
[45] See: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit

School leads fed back that there were pupils who felt stigmatised because they were recruited to ASCENTS. They perceived their invitation to take part as a signal from their teacher that they were at risk of failing their science GCSE. Not only did this demotivate them to take part in ASCENTS, but in these cases, teachers felt that it had damaging effects on their relationship with those pupils and their and engagement with science.

Mentees diverted attention away from other subjects

Mentoring sessions were meant to be delivered outside of lesson time, such as before or after school. To accommodate scheduling conflicts, however, some schools organised mentoring sessions during normal lesson times.

Mentees helped others with their science studies

Mentees and school leads reported examples of mentees sharing strategies and resources from the mentoring sessions with their peers. This is positive for the mentees and their peers, but negative for the robustness of the study. It is positive that learning from ASCENTS was able to be transferred out of mentoring sessions and cascaded to other pupils who could benefit from the strategies offered by mentors. However, this also suggests that there may have been some contamination into the control group.

Evidence, particularly from the IPE, points to the following opportunities to refine ASCENTS, which may increase the likelihood of impact on outcomes.

Recommendations for refining the logic model

Consider the minimum number of sessions for the programme to be effective

Both mentor and mentee absenteeism suggest that 20–23 weeks of mentoring is more than people may be willing to commit to. We recommend that the developer consider what the minimum number of sessions could be for the mentoring to be effective as well as the proximity of those sessions to exams. This would allow mentees and mentors to better understand how to prioritise session attendance.

Consider whether the Revision Day should be an optional component of the programme

The Revision Day component of ASCENTS was not found to be feasible to implement. Those who did participate in a Revision Day, however, did provide positive feedback on the experience. We recommend that the developer consider the Revision Day's role in achieving the programme's desired outcomes and, if it is not essential, this component could be offered as optional.

Consider outcomes for schools and universities

The logic model includes outcomes for mentees and mentors, however the IPE also explored wider outcomes for schools and universities. We recommend including these outcomes on the logic model so that it is a more complete reflection of the programme's anticipated impact.

Specify the amount and nature of ongoing support for mentors

University partners offered a range of ongoing support for mentors beyond the minimum one meeting per term. This suggests that one meeting per term may not have been sufficient for mentors to have the support they needed to deliver the mentoring sessions for the duration of the programme. This support varied across the university partners. We recommend specifying the amount and nature of ongoing support available for mentors. Ongoing support being consistent across the partners increases the likelihood of quality and consistency in mentoring practice, because mentors will be given similar levels of support and opportunities to refine their practice within those support structures. Specifying how much ongoing support is required, as well as reasons for support and what it will cover, will also help university partners and mentors better understand and plan for the time commitment required to participate in ASCENTS.

Specify assumptions in the logic model

We recommend revising the logic model to include key assumptions that should be met in order for impact to be achieved. These could be related to the stability of mentor–mentee pairings and the feasibility of core components such as the number of sessions. Further assumptions could include commitment from schools, mentors, and mentees alike and how

meaningful levels of commitment can be accounted for in recruitment. Alongside this, we recommend RAG (Red, Amber, Green) rating each assumption for their level impact should they be present or absent. This will allow the delivery team to anticipate and mitigate risks to impact on outcomes more proactively and it would allow an additional, useful dimension through which to interpret evaluation results.

Recommendations for refining delivery

Considerations for parents/carers during recruitment

University partners and school leads fed back that parents/carers were not always clear about what ASCENTS offered or the trial conditions. The short recruitment window meant that the school leads did not feel that they had the time to engage with parents/carers so that their questions could be fully answered. Communication materials with parents/carers should be reviewed by the delivery team and include a set of Frequently Asked Questions to increase understanding of the programme and anticipate areas of potential concern.

The trial conditions were an element that parents/carers were concerned about. In any trial, it is essential that parents/carers understand that their child may be allocated to the control group and, therefore, would not receive mentoring. Parents/carers should also be reassured that while data collection from pupils in the control group is still required, this is minimal. For future trials, randomisation at the school level or using a wait list may be mitigate these concerns.

Include motivation as an eligibility requirement

Subject area interest and motivation to improve are key drivers to meaningful engagement and learning outcomes. They should therefore, be considered as an eligibility requirement for participation in ASCENTS as a mentee. Identifying pupils who experience the need to improve combined with motivation may increase the programme's likelihood of impact.

The developers may want to consider pre-intervention resources and activities aimed at eligible pupils that include boosting engagement with science and motivation to improve their attainment.

Increase remuneration for mentors

Mentors felt that remuneration for their role was low, particularly when commuting to their mentee's school was inconvenient. These frustrations were amplified by mentee absenteeism, which could result in them not being paid for the session and drove some to drop out of the programme. Adapting the pay structure may increase mentor retention in ASCENTS, which in turn has the potential to enhance the programme's impact.

Scheduling Revision Days during the set-up phase

Revision Days were not delivered as intended. They were considered challenging to organise and most schools did not engage with this element of ASCENTS. To increase school commitment to the Revision Days, they could be scheduled in advance, during the programme set-up, so that schools are fully aware of when they are happening, what is on offer, and have ample time to make arrangements for transportation and staff cover. Additionally, we recommend that the developer consider the role of Revision Days in the logic model and assess whether they should remain a core component of the intervention or be considered an optional component.

Limitations and lessons learned

The results of this evaluation are limited by missing attendance data and low response rates for the IPE surveys. While it is possible that IPE data is affected by bias, findings are consistent between the impact evaluation and IPE: the impact evaluation did not show conclusive evidence of impact; and the IPE evidence found that the programme was not delivered with fidelity, which may have diminished its impact.

Lessons learned about aspects of the evaluation that should be done differently in the future are aimed at mitigating the risks of contamination, attrition, missing data, and low response rates.

Sample size

At randomisation, the evaluation was powered to detect an MDES of 0.16 for the primary analysis. This is within the threshold needed to achieve the EEF 5-padlock rating (<=0.2). Overall, school-level attrition from randomisation to analysis was approximately 11% (n=7 schools). Pupil attrition from randomisation to analysis was 18.9% for the intervention group and 16.7% for the control group. The overall pupil attrition across both groups was 17.8%. This pupil-level attrition was exacerbated by school withdrawal and lack of pupil consent to process their data. This study, therefore, lost a padlock for attrition (11–20% at pupil level for a 4-padlock rating).

At the analysis stage, the evaluation was powered to detect an MDES of 0.20. The increase in the MDES relative to the SAP[46] reflected a lower-than-anticipated correlation between baseline and endline attainment (0.34 compared with an assumed value of 0.54), which reduced the precision gained from adjusting for baseline attainment. In addition, while overall pupil attrition remained below the maximum projected level of 20% specified in the SAP, the realised average cluster size at analysis (12.1 pupils per school) was smaller than assumed at the SAP stage (12.98 pupils, and 15 pupils under the maximum projected attrition scenario).

The impact evaluation did not find evidence of an effect of ASCENTS on GCSE science attainment. There was weak evidence of a small positive effect, but the range of possible effects were wide and included no effect. This evaluation was powered to detect an MDES of 0.20, which translates into three months' progress. Therefore, with a larger sample, a smaller effect size could have been distinguished from no effect.

Out of the 57 schools involved, only 28 (49%) completed the post-intervention school survey. This lower response rate resulted in a reduced sample size for the cost evaluation, limiting its robustness. Additionally, the self-selection bias inherent in the respondents, such as representing the more engaged or keen participants, may further complicate the generalisability of the findings. The perspectives of the non-respondents remain unknown, which could have influenced the overall cost evaluation. A larger sample size would have provided a more comprehensive representation of the participating schools' experiences. Therefore, we recommend interpreting the average cost figures with caution due to the low response rate.

Risk of contamination from business as usual

ASCENTS was not intended to reduce business as usual support for science or other subjects. This support included mentoring and/or tutoring. There are ethical arguments to support this. The GCSE exam period is high stakes for pupils, and they deserve every opportunity available to help them succeed. In future evaluation, engagement with mentoring should be more tightly controlled and monitored. This would allow future trials to better understand the extent that ASCENTS was additional to business as usual support and how similarly pupils in the control and intervention groups engaged with business as usual support.

Improve processes for sharing attendance data

School leads should be consulted on the process for recording and sharing attendance data during the set-up phase of any future evaluation so that burden is minimised and they are more likely to share this essential evaluation data.

Survey mode

Online surveys have several operational benefits; however, they are easy for respondents to dismiss. We recommend using paper surveys for school-based interventions where completing the survey can be integrated into delivery with an increased likelihood of completion. This can be achieved without undermining informed consent and the voluntary nature of participating in IPE data collection.

[46] See: https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/ascents-121-support-for-science-2023-24-trial

Future research and publications

The results from the longitudinal follow-up study with mentees and mentors will be published in 2027 and 2029, respectively.

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Appendix A: EEF cost rating

Appendix A Table 1: Cost rating

Cost rating	Description
£ £ £ £ £	*Very low:* less than £80 per pupil per year.
£ £ £ £ £	*Low:* up to about £200 per pupil per year.
£ £ £ £ £	*Moderate:* up to about £700 per pupil per year.
£ £ £ £ £	*High:* up to £1,200 per pupil per year.
£ £ £ £ £	*Very high:* over £1,200 per pupil per year.

Appendix B: Security classification of trial findings

OUTCOME: *GCSE SCIENCE ATTAINMENT*

Rating	Criteria for rating			Initial score		Adjust		Final score
	Design	MDES	Attrition					
5	Randomised design	<= 0.2	0-10%					
4	Design for comparison that considers some type of selection on unobservable characteristics (e.g. RDD, Diff-in-Diffs, Matched Diff-in-Diffs)	0.21 - 0.29	11-20%	**4**				
3	Design for comparison that considers selection on all relevant observable confounders (e.g. Matching or Regression Analysis with variables descriptive of the selection mechanism)	0.30 - 0.39	21-30%			**Adjustment for threats to internal validity [-1]**		**3**
2	Design for comparison that considers selection only on some relevant confounders	0.40 - 0.49	31-40%					
1	Design for comparison that does not consider selection on any relevant confounders	0.50 - 0.59	41-50%					
0	No comparator	>=0.6	>50%					

Threats to validity	Risk rating	Comments
Threat 1: Confounding	Low	Randomisation procedure was appropriate and conducted independently. Small imbalance in pre-test in favour for the control group for KS2 maths and reading attainment (0.07), which was controlled for in the model. Sensitivity analysis returned results comparable to main outcome effect.
Threat 2: Concurrent Interventions	Low	Schools continued to offer a range of other science support activities, available to both intervention and control pupils. Very limited survey response rates provide no strong evidence of differential uptake.
Threat 3: Experimental effects	Low	Potential for contamination is explored in the report. Very limited survey responses offer no strong evidence of the control group accessing elements of the intervention.

Threat 4: Implementation fidelity	Moderate	Implementation fidelity was low to moderate, with some elements not delivered as intended. This included the Revision Days, and consistency in mentor / mentee pairings (identified as an important causal mechanism).
Threat 5: Missing Data	Moderate	Moderate level of missing data, with attrition from Pupil NPD consent to analysis at 9.8%. Patterns of missingness were explored, with some regional patterns observed. Analysis of missing data returned similar result to complete case analysis.
Threat 6: Measurement of Outcomes	Low	Primary outcome used data from the NPD (GCSE science); baseline was teacher-assessed Science attainment at Key Stage 2. Assessments blinded to allocation; valid and reliable measures.
Threat 7: Selective reporting	Low	Analytical approach was as per study plan and SAP.

- **Initial padlock score:** [4] Padlocks – This was a well-designed multi-site trial, with a MDES at randomisation of 0.16 and a pupil-level attrition rate of 17.76%.
- **Reason for adjustment for threats to validity:** [-1] Padlocks – Challenges with implementation fidelity suggests that the impact estimate may be underestimated. The trial also had a moderate level of missing data, and the low IPE survey response rate makes it hard to confirm that contamination or differential uptake of concurrent interventions was not an issue.
- **Final padlock score:** Initial score adjusted for threats to validity = [3] Padlocks.

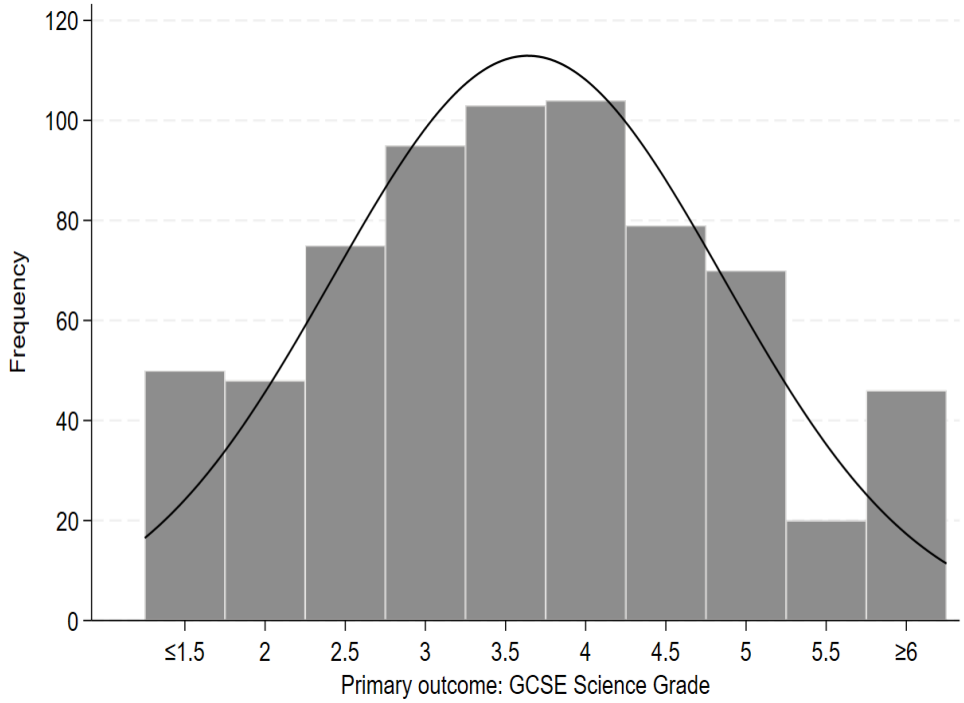
Appendix C: Changes since the previous evaluation

Appendix C Table 1: Changes since the previous evaluation

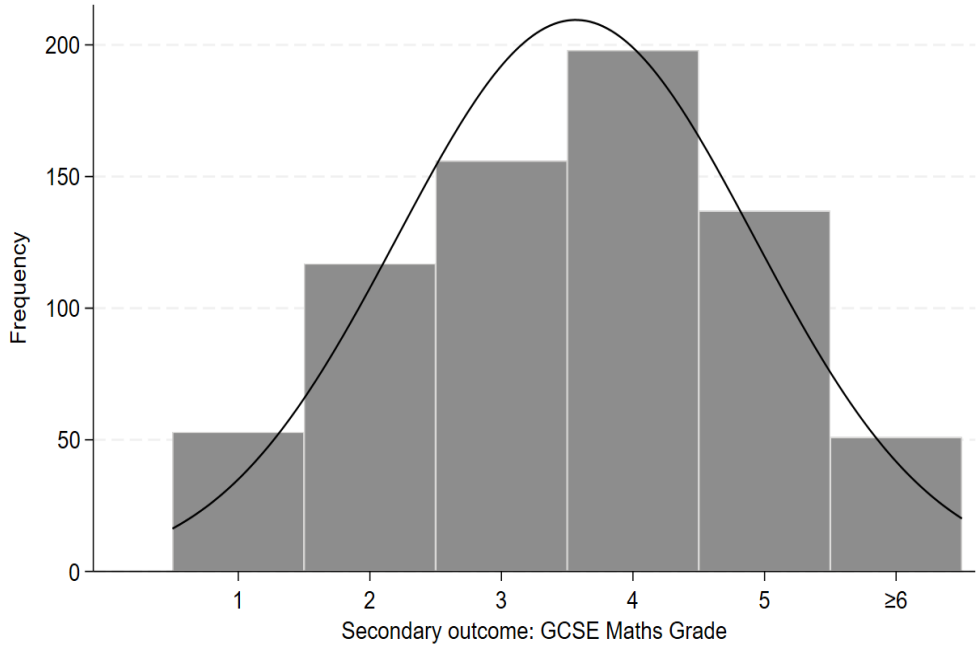
	Feature	Pilot to efficacy stage	First efficacy trial to second efficacy trial
Intervention	Intervention content	Due to Covid-19 disruption, the Revision Days were cancelled in the first efficacy trial	Ongoing support for mentors was changed from ad hoc to a more structured minimum of one meeting per term Resources with strategies for engaging quieter or more shy pupils was provided to mentors Schools were offered the option to host a three-hour revision session at their school in place of a university-hosted Revision Day. This change was made in response to low uptake from schools on the Revision Day sessions
	Delivery model	No change	No change
	Intervention duration	No change	Reduced from 23 weeks to 20 weeks due to delays with recruitment
Evaluation	Eligibility criteria	No change	No change for pupil or school eligibility criteria Eligibility criteria for mentors was expanded to include a wider variety of STEM-related degrees to address recruitment challenges
	Level of randomisation	No change	No change
	Outcomes and baseline	No change	No change
	Control condition	Not applicable	No change

Appendix D: Distribution of outcomes at endline

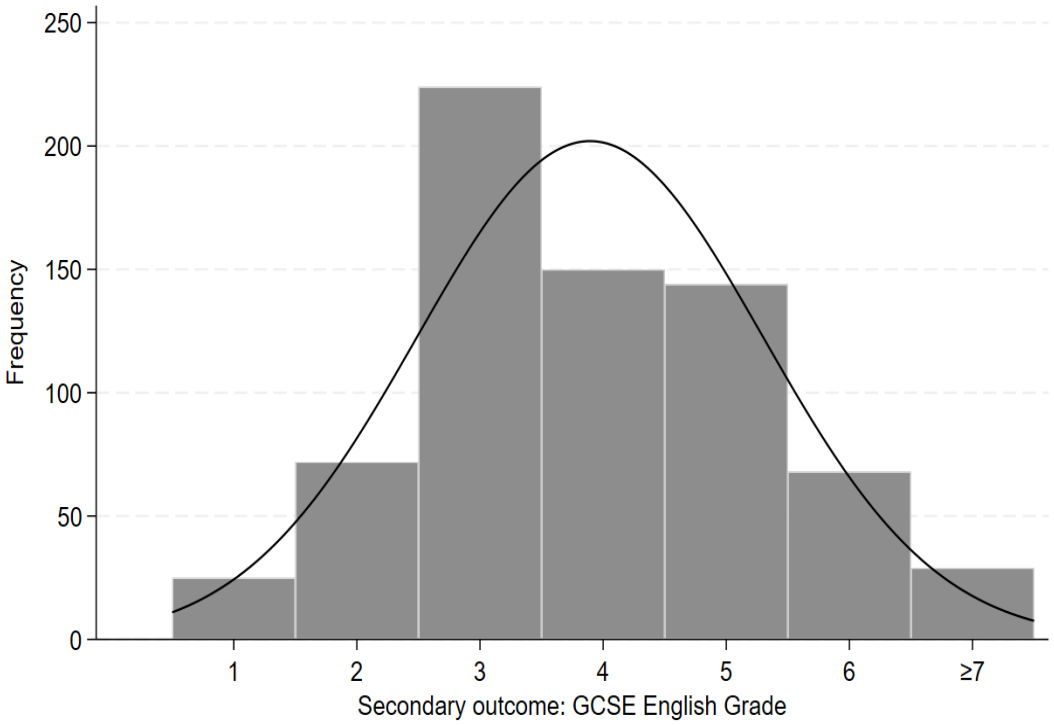
Appendix D Figure 1: Distribution of GCSE science grades for primary analysis (full analysis sample)



Appendix D Figure 2: Distribution of GCSE maths grades for secondary analysis (full analysis sample)



Appendix D Figure 3: Distribution of GCSE English grades for secondary analysis (full analysis sample)



Appendix E: Additional analyses and robustness checks

Appendix E Table 1: Additional analysis, by Key Stage 2 maths as baseline measure

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.14	0.08	336 (38)	1.88	347 (44)	1.75	1.81

Appendix E Table 2: Additional analysis, by Key Stage 2 maths as baseline measure, effect size estimations

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges' g (95% CI)	P-value
GCSE science	336 (38)	3.76 (3.61, 3.9)	347 (44)	3.62 (3.48, 3.76)	683 (336; 347)	0.06 (-0.09, 0.21)	0.366

Appendix E Table 3: Additional analysis, by Key Stage 2 reading as baseline measure

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.13	0.07	336 (38)	1.87	346 (45)	1.73	1.8

Appendix E Table 4: Additional analysis, by Key Stage 2 reading as baseline measure, effect size estimations

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (Intervention; control)	Hedges' g (95% CI)	P-value
GCSE science	336 (38)	3.76 (3.61, 3.91)	346 (45)	3.62 (3.49, 3.76)	682 (336; 346)	0.06 (-0.09, 0.21)	0.412

Appendix E Table 5: Additional analysis, by gender and region

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.14	0.13	340 (34)	1.87	350 (41)	1.75	1.81

Appendix E Table 6: Additional analysis, by gender and region, effect size estimations

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (Intervention; control)	Hedges' g (95% CI)	P-value
GCSE science	340 (34)	3.75 (3.6, 3.89)	350 (41)	3.61 (3.47, 3.75)	690 (340; 350)	0.10 (-0.05, 0.25)	0.155

Appendix E Table 7: Additional analysis, by imbalance at baseline

Outcome	Unadjusted differences in means	Adjusted differences in means	Treatment group		Control group		Pooled variance
			n (missing)	Variance of outcome	n (missing)	Variance of outcome	
GCSE science	0.14	0.07	334 (40)	1.88	345 (46)	1.74	1.81

Appendix E Table 8: Additional analysis, by imbalance at baseline, effect size estimations

Outcome	Unadjusted means				Effect size		
	Treatment group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	P-value
GCSE science	334 (40)	3.76 (3.61, 3.91)	345 (46)	3.62 (3.48, 3.76)	679 (334; 345)	0.05 (-0.10, 0.20)	0.438

Appendix F: Missing data analysis

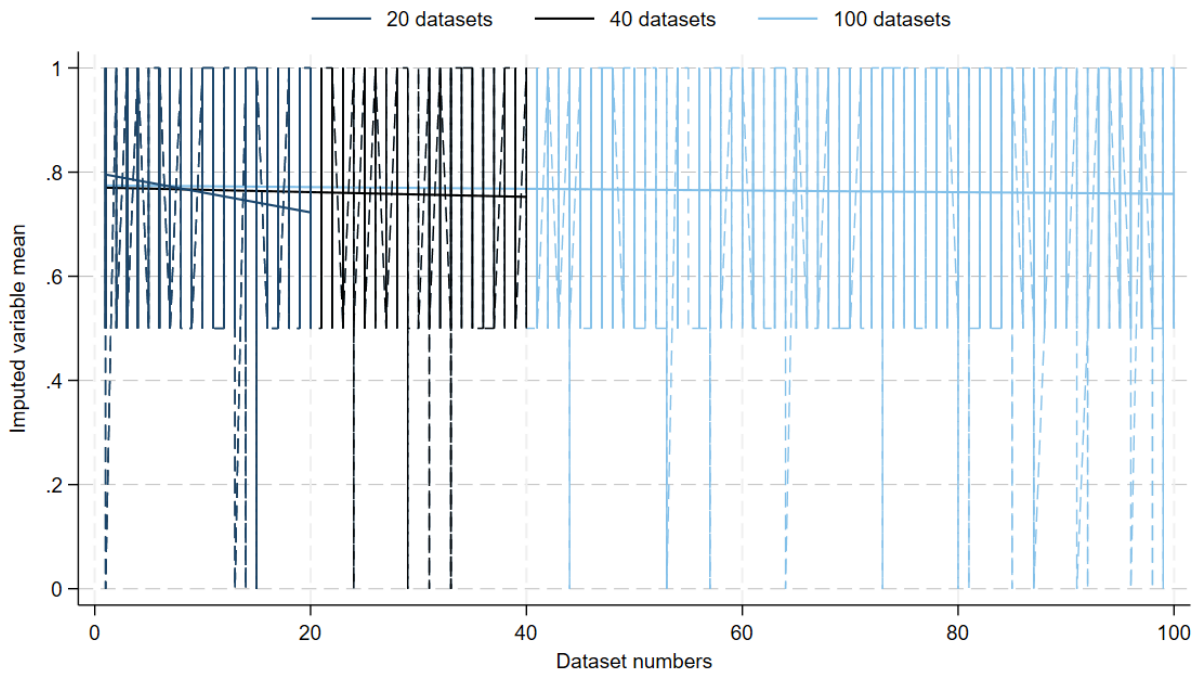
Appendix F Table 1: Determinants of data missingness, by Key Stage 2 science

Variable	Coefficient	Standard error	z	P > |z|	95% CI
Treatment	-0.045	0.372	-0.120	0.904	-0.774, 0.685
Gender: Female	-0.175	0.312	-0.560	0.575	-0.787, 0.437
Key Stage 4 science (corr.)	0.329	0.239	1.380	0.168	-0.139, 0.797
Key Stage 4 English (corr.)	-0.025	0.173	-0.150	0.884	-0.365, 0.315
Key Stage 4 maths (corr.)	-0.162	0.368	-0.440	0.660	-0.883, 0.559
Key Stage 2 maths mark (corr.)	-0.001	0.012	-0.040	0.965	-0.023, 0.022
Key Stage 2 reading mark (corr.)	-0.008	0.020	-0.400	0.688	-0.047, 0.031
Key Stage 4 FSM eligible	1.077	0.696	1.550	0.122	-0.287, 2.442
GCSE attainment score (corr.)	-0.079	0.119	-0.660	0.508	-0.311, 0.154
GCSE attainment grade 4	0.013	0.063	0.200	0.838	-0.111, 0.137
Rural	-0.239	0.700	-0.340	0.733	-1.612, 1.134
East of England	1.184	0.754	1.570	0.116	-0.294, 2.661
London	1.149	0.845	1.360	0.174	-0.508, 2.806
North East	1.508	0.699	2.160	0.031	0.137, 2.879
North West	0.722	0.757	0.950	0.340	-0.762, 2.206
South West	0.994	1.190	0.840	0.404	-1.339, 3.328
Yorkshire and the **Humber**	0.862	0.878	0.980	0.326	-0.860, 2.584
Maintained school	-0.697	0.727	-0.960	0.338	-2.122, 0.728
FSM eligibility	-0.027	0.025	-1.090	0.277	-0.077, 0.022
Constant	-1.361	2.946	-0.460	0.644	-7.136, 4.414
School_id					
var(_cons)	0.036	0.307			0.000, 685000.000

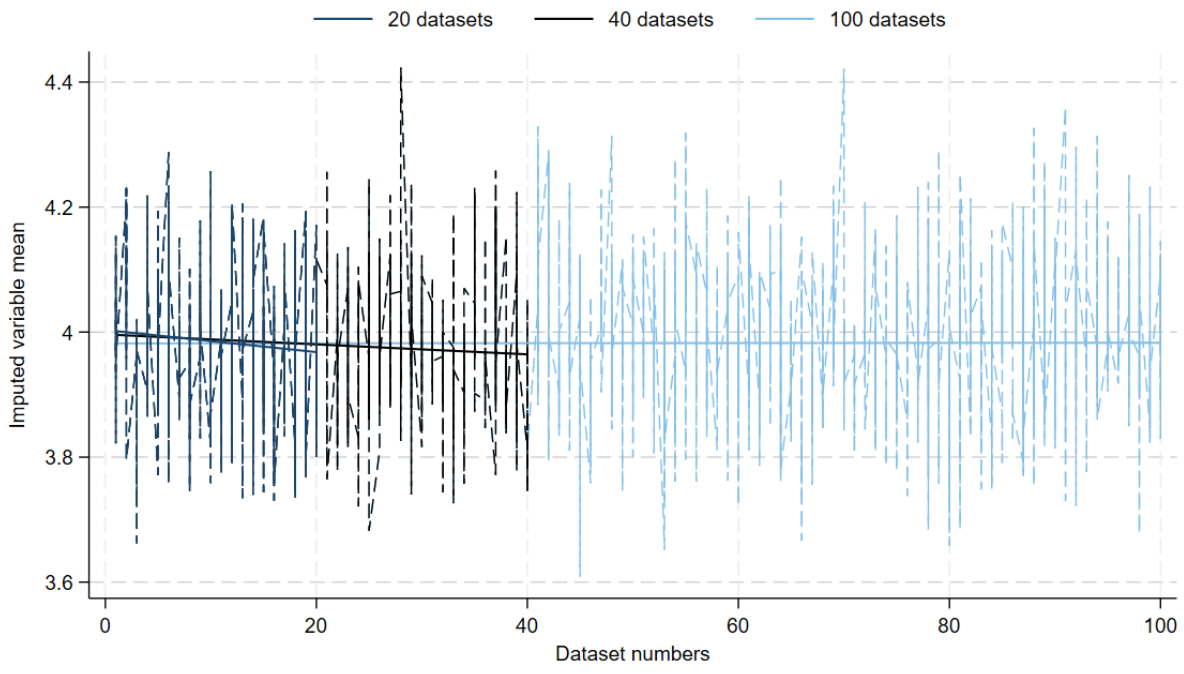
Appendix F Table 2: Determinants of data missingness, by Key Stage 4 science

Variable	Coefficient	Standard error	z	P > |z|	95% CI
Treatment	-0.348	0.374	-0.930	0.353	-1.081, 0.385
Gender: Female	0.242	0.327	0.740	0.460	-0.400, 0.883
Key Stage 2 science (corr.)	-0.156	0.480	-0.330	0.745	-1.097, 0.785
Key Stage 2 maths mark (corr.)	0.013	0.015	0.810	0.417	-0.018, 0.043
Key Stage 2 reading mark (corr.)	0.015	0.028	0.540	0.587	-0.040, 0.070
Key Stage 4 FSM eligible	2.154	1.869	1.150	0.249	-1.508, 5.817
GCSE attainment score (corr.)	-0.177	0.143	-1.240	0.215	-0.458, 0.103
GCSE attainment grade 4	0.045	0.077	0.580	0.560	-0.107, 0.197
Rural	-1.096	1.035	-1.060	0.290	-3.126, 0.933
East of England	1.744	1.103	1.580	0.114	-0.418, 3.906
London	4.075	1.177	3.460	0.001	1.769, 6.381
North East	0.439	0.803	0.550	0.584	-1.134, 2.013
North West	1.223	1.106	1.110	0.269	-0.945, 3.391
South East	5.841	1.604	3.640	0.000	2.698, 8.984
South West	2.699	0.891	3.030	0.002	0.952, 4.446
Yorkshire and the Humber	0.000	—	—	—	—
Maintained school	-1.087	0.975	-1.110	0.265	-2.998, 0.824
FSM eligibility	0.029	0.035	0.850	0.396	-0.038, 0.097
Constant	-4.027	6.022	-0.670	0.504	-15.830, 7.777
School_id					
var(_cons)	0.703	0.369			0.251, 1.965

Appendix F Figure 1: Key Stage 2 science multiple imputation convergence

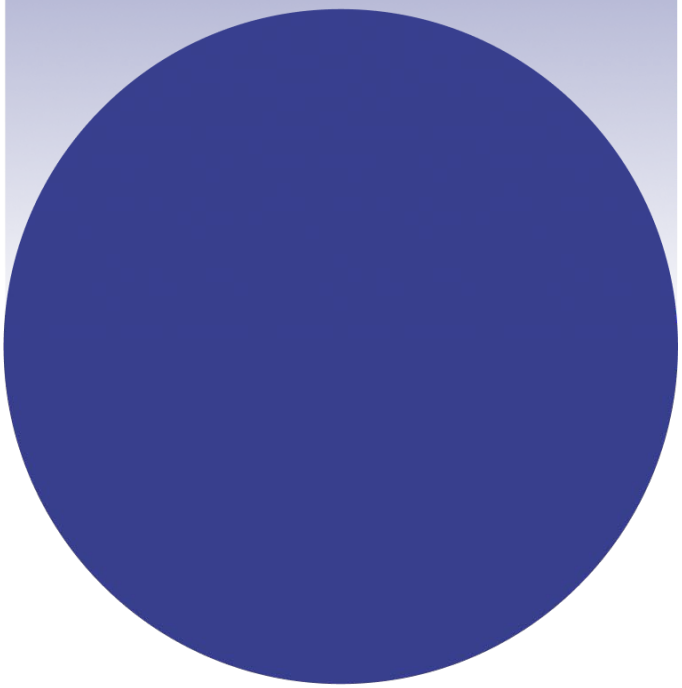


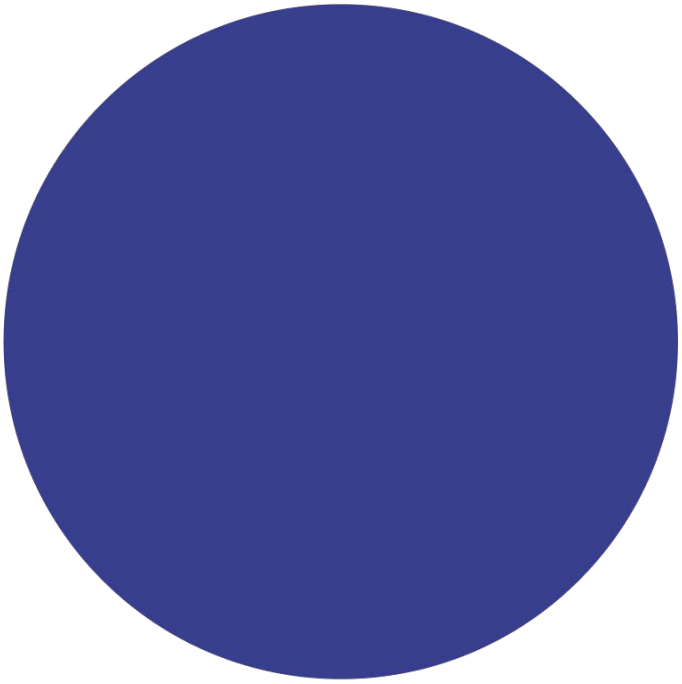
Appendix F Figure 2: Key Stage 4 science multiple imputation convergence



Further Appendices

Appendix G – S can be found on the project page, published as ‘Further Appendices’ document.





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