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## Leveraging Pupil-Tutor Similarity to Improve Pupil Attendance

Nimble Trial Report

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THE  
**BEHAVIOURAL  
INSIGHTS  
TEAM**



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## About the evaluator

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## Executive summary

### The project

The Education Endowment Foundation (EEF) led the management of the Tuition Partners (TP) pillar of the National Tutoring Programme (NTP) in 2020/2021, funded as part of the government's COVID-19 catch-up package. The TP programme allowed schools to access subsidised tuition from a list of 33 tuition partners, quality-approved by the EEF, to support pupils who have missed out the most as a result of school closures due to the COVID-19 pandemic. The focus was to support disadvantaged pupils, in particular those eligible for Pupil Premium; however, schools had the flexibility to select pupils to take part.

The EEF commissioned the Behavioural Insights Team (BIT) to run a reach and engagement nimble randomised controlled trial (RCT) with four approved NTP Year 1 (2020/2021) Tuition Partners: The Tutor Trust, Manning's Tutors, Tute, and Schools Partnership Tutors. The purpose of this trial was to test whether a light-touch intervention that leverages similarities between pupils and tutors increases pupil attendance at tutoring sessions. The intervention involved a web-based survey in which pupils and tutors were asked about their personal interests, hobbies, and preferences. Once completed, both tutors and pupils received instant feedback on their similarities. Tutors also received reminders of their similarities with their pupils for the subsequent five weeks, including some suggested conversation prompts.

The target group were tutors and pupils associated with The Tutor Trust, Manning's Tutors, Tute and Schools Partnership Tutors: both primary and secondary age pupils participated in the trial. The intervention was trialled in a two-arm cluster randomised trial, with randomisation at the tutor level. The tutor was therefore able to use the intervention with all of the pupils they taught; 701 tutors and 8,922 pupils were involved in this trial.

Table 1: Summary of findings

| Research question                                                                                                                                       | Finding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does an online activity seeking to leverage similarities between tutors and pupils increase pupils' attendance at tutoring sessions?                    | <p>Across the four Tuition Partners, pupils in the treatment arm had an attendance rate at tutoring sessions that was 4.2pp (95% CI: 1.5pp, 6.8pp) higher than those in the control group, meaning that the relationship-building activity performed better than the tutoring providers' 'business as usual' practice.</p> <p>This is a meaningful effect, which is in line with other successful educational interventions aiming to change real-world behaviours. However, this positive effect was larger for two of the Tuition Partners and negligible for the other two, suggesting that a wider exploration of variation between tutoring organisations and implementation factors is also helpful.</p> |
| Does an online activity seeking to leverage similarities between tutors and pupils increase Pupil Premium (PP) pupils' attendance at tutoring sessions? | <p>Pupil Premium pupils in the treatment arm had an attendance rate at tutoring sessions that was 2.6pp (95% CI: -0.004pp, 5.6pp) higher than those in the control group, meaning that the relationship-building activity performed better than the tutoring providers' 'business as usual' practice.</p> <p>Again, this positive effect was larger for two of the Tuition Partners and negligible for the other two.</p>                                                                                                                                                                                                                                                                                      |

### Additional findings

The scoping phase of this project (including interviews with Tuition Partners) indicated that pupil attendance at tutoring sessions is a common challenge, with a number of contributing factors. One specific factor—the quality of the pupil-tutor relationship—was identified consistently across the TPs as of particular importance. TPs identified that when pupils and tutors had better relationships, pupils were more likely to attend sessions and more likely to engage in the learning process. Given this, this trial sought to evaluate an intervention specifically aimed at improving the pupil-tutor relationship.

In the impact evaluation, which measured the primary outcome of attendance (calculated by dividing the number of session hours attended by the number of session hours purchased for that pupil) it did appear that there was a differential impact across Tuition Partners (TPs).

Two TPs, The Tutor Trust and Schools Partnership Tutors, saw large positive effects for those receiving the intervention: 5.4pp (95% CI: 3.7pp, 7.2pp) and 7.2pp (95% CI, 1.2pp, 13.3pp) respectively in comparison to a control group; two TPs, Tute and Manning's Tutors, saw negligible effects: 0.1pp (95% CI: -4.8pp, 5.0pp) and 1.2pp (95% CI: -3.3pp, 5.7pp) respectively.

These differences between TPs may have been influenced by a range of factors, including whether sessions were delivered face to face or online, how responsive tutors were to messages from their organisation, and the varying composition of the tutoring provider's workforce (for example, university students or fully qualified teachers). The Tutor Trust and Schools Partnership Tutors, which experienced a larger positive impact, typically delivered sessions face to face, which may have made it easier to integrate the activity into sessions. However, it should be noted that these are hypotheses which this trial was not designed to investigate and warrant further research.

In the implementation and process evaluation (IPE), completion rates were collected to understand better delivery implementation: 68% of tutors were reported to have partially completed the intervention (online tutor survey) while 21% of tutors were reported to have fully completed the intervention (completed the online survey and recorded at least one associated pupil survey response also recorded).

A case study was also collated for each Tuition Partner, which gathered multiple perspectives: interviews with tutors and an interview with at least one member of staff from the TP. Interviews with tutors suggested that the intervention may have been particularly effective for tutors who had less experience. From attendance data, the intervention appears to have been most effective for tutors with very little experience (less than one year) and was directionally positive for all other subgroups with the exception of tutors that did not specify their previous work experience. However, sample size is not significant enough to assess whether there is a causal link between the level of experience and the effectiveness of the intervention.

Tutors had mixed views on whether the online tutoring format served as a barrier to effective implementation of the activity. Tutors reported that the survey contributed to the pupil-tutor relationship by stimulating conversation, which can be difficult, particularly in an online environment; however, in a face to face environment, pupils did not always have the access to technology to complete the survey. Some tutors perceived the activity to work particularly well for specific groups of pupils, for example, those with SEND, who may find it harder to open up and engage with teachers and tutors.

Given that the intervention's mechanisms—in other words, how the intervention improves the pupil-tutor relationship—likely hold in other tutoring contexts and the diversity of TPs involved in this trial, it is believed that these findings are generalisable to the broader U.K. tutoring sector, though further empirical testing would be valuable to add confidence to this statement.

## Introduction

As part of the government's response to COVID-19-related school closures, the Education Endowment Foundation (EEF) led the management of the Tuition Partners (TP) pillar of the National Tutoring Programme (NTP) in 2020/2021. The TP programme allowed schools to access subsidised tuition from a list of 33 tuition partners, quality approved by the EEF, to support pupils whose learning had been impacted by school disruption due to the coronavirus pandemic (COVID-19). The focus was on supporting disadvantaged pupils, in particular those eligible for Pupil Premium, though schools did have flexibility to select pupils they felt were in most need of support. The NTP subsidised the lessons by 75%, with the schools paying the remaining 25%.

In addition to the overarching evaluation of the NTP, the EEF commissioned a series of evaluations to assess different strategies to reach and engage schools, tutors, and pupils. This report presents findings from one such trial that tested whether an intervention that identified similarities between tutors and pupils could improve pupils' attendance at tutoring sessions.

## Background evidence

Interviews with the TPs during the scoping phase of this project indicated that pupil attendance at tutoring sessions is often an issue, with attendance rates typically varying between 67% and 80%. Interviews during the scoping phase identified a large number of factors that contribute to poor attendance included the capacity of the lead teacher to follow up with pupils, the timing of sessions, and the support of parents. However, one specific factor—the quality of the pupil-tutor relationship—was identified consistently across the TPs and was considered to be of particular importance. TPs explained that from their experience, when pupils and tutors had better relationships, pupils were more likely to attend sessions and more likely to engage in the learning process. Given this, this trial sought to evaluate an intervention specifically aimed at improving the pupil-tutor relationship.

There is some evidence to suggest that informing teachers and pupils of their similarities can boost teacher-pupil relationships and subsequently improve academic achievement. Cornelius-White (2007) finds in a meta-analysis that teacher-pupil relationships are indeed correlated with academic achievement. In the U.S. study that inspired the intervention tested in this trial, providing teachers and pupils in ninth grade (the equivalent of Year 10 in the U.K.) with information on their similarities improved teachers' perceptions of their relationship with students (Gehlbach et al., 2016). Pupils who received feedback on their similarity with their teacher also seemed to earn higher course grades, though this result was not statistically significant. In a further study in a university context, Robinson et al. (2019) found that this approach did increase perceptions of similarity but did not lead to improved academic outcomes. Despite this, it was believed that the intervention would be more likely to work in a small group tutoring context in schools where there would be sufficient time for tutors and pupils to explore their similarities—something that may not have been possible in a university environment where class sizes are often larger. This view was shared by Professor Todd Rogers and Dr Carly Robinson, two of the authors of the original U.S. intervention.

The Behavioural Insights Team (BIT) and the EEF considered there to be sufficient evidence of promise to conduct a nimble trial evaluating the intervention in the U.K. tutoring context.

## Intervention

The intervention involved both tutors and pupils completing a survey to identify similarities between themselves, followed by personalised email prompts to the tutor reminding them to use the similarities in future sessions.

**Table 2** contains an overview of the intervention and Appendix A contains example materials from the intervention.

Table 2: Intervention overview

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intervention name      | Leveraging Similarity to Improve Pupil Attendance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Why (theory/rationale) | Perceived similarity is a key predictor of relationship satisfaction (Morry 2018). Previous studies suggested that informing teachers and pupils of their similarities can boost teacher-pupil relationships and subsequently improve academic achievement (Gehlbach et al., 2016). Discussions with two of the authors of these studies, Prof Todd Rogers and Dr Carly Robinson, suggested that this approach may be more effective in a small-group tutoring context where there is sufficient time for tutors and pupils to explore their similarities.                                                                                                                                   |
| Who (recipients)       | Both tutors and pupils participated in the intervention. Tutors then received ongoing reminders of their similarities with pupils.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| What (materials)       | <p>A web-based survey that provided instant feedback on similarities (for example, shared hobbies, interests) accompanied by:</p> <ul style="list-style-type: none"> <li>• an implementation guide and a short implementation video outlining to tutors exactly how they and their pupils should complete the web-based survey;</li> <li>• an email with a list of similarities sent to tutors immediately after completing the survey; and</li> <li>• a weekly email to tutors (for five subsequent weeks after completing the initial survey) reminding them of similarities they have with each pupil.</li> </ul> <p>See Appendix A for further detail on the intervention materials.</p> |
| What (procedures)      | The web-based survey asked pupils and tutors about their personal interests, hobbies, and preferences. Once completed, both pupils and tutors received instant feedback on their similarities as well as prompts to discuss these. Tutors then received reminders of their similarities with their pupils for the subsequent five weeks, including some suggested conversation prompts.                                                                                                                                                                                                                                                                                                      |
| Who (provider)         | BIT provided the intervention materials to TPs who then shared them with tutors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| How (delivery mode)    | <p>The link to the website and guidance on the activity was provided to tutors by the TP that they worked with. Tutors then provided the link to their pupil(s).</p> <p>The ongoing reminders to tutors of their similarities with pupils were sent by email. These were sent automatically by the online web platform that hosted Snap Survey.</p>                                                                                                                                                                                                                                                                                                                                          |
| Where (location)       | The intervention was implemented in tutoring sessions (online or in person, with online the dominant model). <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

<sup>1</sup> This intervention was implemented during a period where schooling and tutoring modality depended on national/local COVID-19 restrictions.

|                            |                                                                                                                                                                                                                                                                          |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| When and how much (dosage) | The initial similarities survey was intended to be delivered once, towards the beginning of the tutoring sessions. Tutors were then sent five reminders of similarities they share with their pupils over the five subsequent weeks after completing the initial survey. |
| Tailoring (adaptation)     | All tutors received the same initial survey. Given the nature of the intervention, the similarities feedback provided to tutors and pupils—and the subsequent reminders to tutors—were personalised based on the similarities identified from the survey.                |

### Fidelity definition

Tutors follow the instructions when completing the similarity survey with pupils. They spend adequate time completing the survey and ask pupils to complete the survey. The tutor uses the survey results in sessions with their pupils as the starting point for conversations. These might go in any number of directions depending on the specific individuals and their tutoring relationship.

### Compliance definition

Full compliance with the intervention was defined as the tutor and at least one of their pupils completing the online survey. Partial compliance with the intervention was defined as just the tutor completing the online survey.

## Research questions

### Impact evaluation

This trial aimed to address the following research questions as set out in the study protocol:

- RQ1** Does sending tutors materials to leverage similarities between the tutor and their pupils increase pupils' attendance at tutoring sessions?
- RQ2** Does sending tutors materials to leverage similarities between the tutor and their pupils increase pupils' attendance at tutoring sessions among pupils who are on Pupil Premium?

The study protocol can be found on the EEF's website (linked [here](#)). It was also pre-registered on the OSF portal (linked [here](#), searchable using the identifier *u36fb*).

### Implementation and process evaluation

The implementation and process evaluation (IPE) aimed to address the following research questions as set out in the study protocol:

1. What proportion of tutors in the treatment group used the intervention materials and had at least one of their pupils use the materials (compliance)?
2. How many tutors and pupils completed the survey (reach)?
3. How did tutors and TP staff experience the intervention (quality)?
4. How was the intervention implemented (fidelity)?
5. What were the barriers and facilitators to implementation and delivery? How much similarity did tutors and pupils share on average (mechanisms)?

## Methods

### Trial design

The trial design was a two-armed cluster randomised trial that aimed to test the impact of an intervention designed to increase the sense of similarity between tutors and pupils. The two arms of the trial were:

#### Control

Tutors in the control arm received the TP's 'business as usual' training and support. Tutors from all TPs completed an initial training before completing any sessions which covered important topics such as child safeguarding and lesson planning and may have also discussed the importance of establishing positive relationships with pupils. Tutors and pupils in the control group likely still did a brief self-introduction at the start of the lessons. However, it is unlikely the 'business as usual' training provided structured activities in the way the treatment group did.

#### Treatment

Tutors in this group received the intervention activity by email. Details of the content of this activity can be found in Table 2 and Appendix A.

Table 3 provides a summary of the trial design; Figure 1 is the CONSORT trial diagram.<sup>2</sup>

Table 3: Trial design

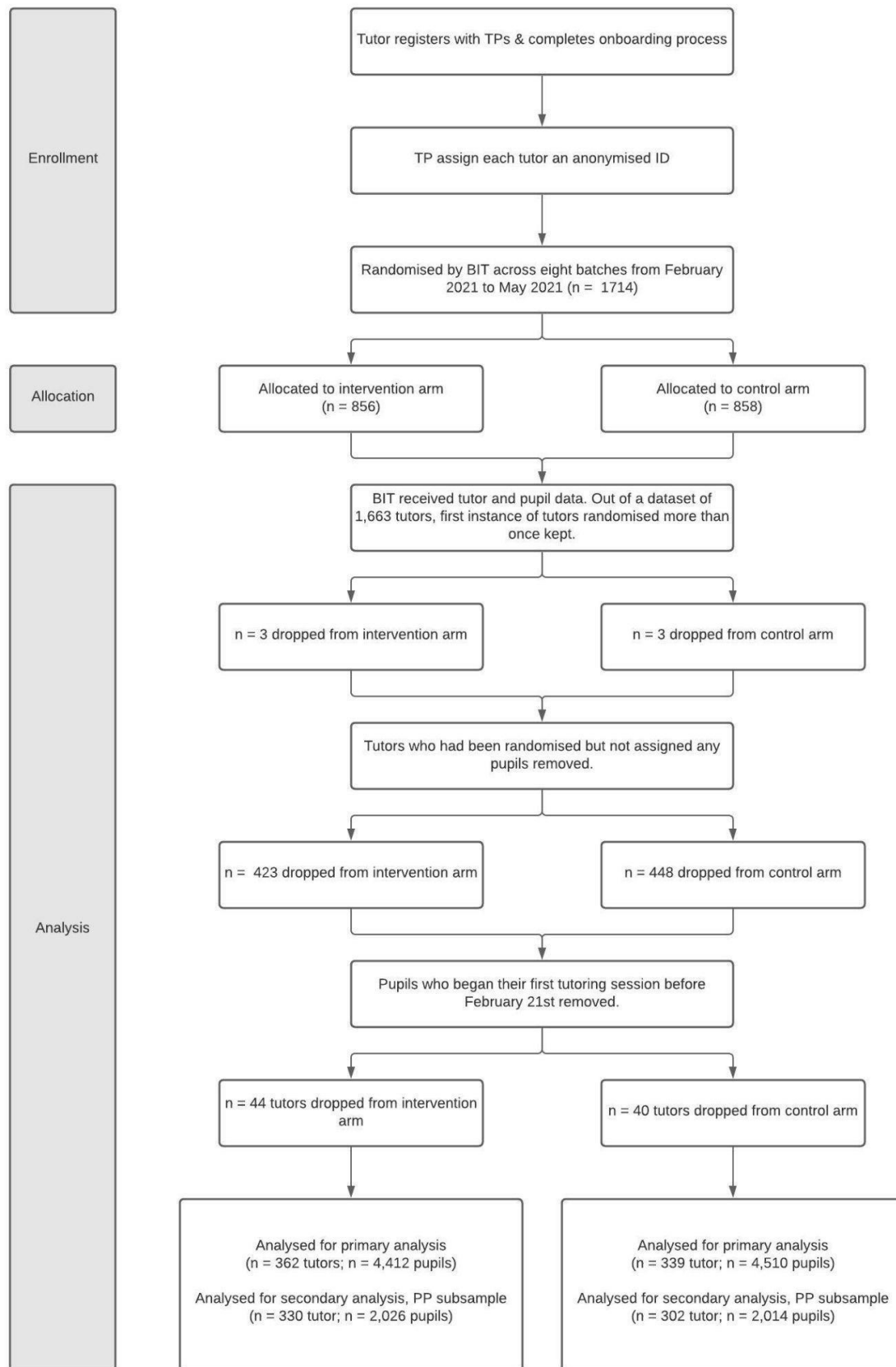
|                                             |                                     |                                                                                                                                                                                                                    |
|---------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trial design, including number of arms      |                                     | Two-arm, cluster randomised trial.                                                                                                                                                                                 |
| Participants                                | inclusion criteria                  | Tutors and pupils at participating TPs.                                                                                                                                                                            |
|                                             | exclusion criteria                  | Pupils that have started their first tutoring session before or on 1 Feb 2021.                                                                                                                                     |
|                                             | target number                       | 29,000 pupils; 1,300 tutors.                                                                                                                                                                                       |
| Unit of randomisation                       |                                     | Tutor.                                                                                                                                                                                                             |
| Stratification variables<br>(if applicable) |                                     | Stratify by TP (a. The Tutor Trust, b. Manning's Tutors, c. Tute, d. Schools Partnership Tutors) for each batch of data.                                                                                           |
| Primary outcome                             | variable                            | Pupil attendance rate for tutoring sessions, expressed as a proportion of sessions bought.                                                                                                                         |
|                                             | measure (instrument, scale, source) | The proportion (expressed as a percentage) of hours tutoring sessions attended by each pupil out of those bought by their school.<br><br>This information was provided to NFER by the individual TPs. <sup>3</sup> |

<sup>2</sup> The Consort flow chart is a diagram of the progress through the phases of a parallel randomised trial of two groups (that is, enrolment, intervention allocation, follow-up, and data analysis): <http://www.consort-statement.org/consort-statement/flow-diagram>

<sup>3</sup> BIT liaised with the TPs involved in this trial to ensure they understood the importance of accurate data collection. In addition, TPs attended seminars held by NFER in which they were instructed on data collection. It was believed that these strategies minimised the risk of inaccurate data collection (for example, tutoring partners rectifying the number of sessions bought if a pupil drops out).

|  |                          |                                                                                                                                                           |
|--|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | direct measure or proxy? | Direct measure.                                                                                                                                           |
|  | baseline measure         | 73% (SD = 28%).                                                                                                                                           |
|  | time of collection       | Pupil's attendance was recorded during every session by the TPs individually and shared with NFER at the end of the trial period (Friday 27 August 2021). |

Figure 1: CONSORT flowchart



The only important change made to the original trial design was the delaying of the end of the trial from 31 July to 27 August. This was due to the NTP's decision to permit tutoring sessions to continue over the summer holidays.

Minor deviations to the trial protocol (pre-agreed with the EEF) are reported in the Deviation from the Trial Protocol section.

## Participant selection

All tutors working for the participating TPs were eligible to take part in the trial. However, the TPs were recruiting and incorporating tutors throughout the trial period meaning that they were unable to identify all of the eligible tutors at the start of the trial. As such, the TPs compiled a list of newly recruited tutors on a fortnightly basis that was then shared with BIT for randomisation.

If a tutor was not assigned to a pupil during the trial period, after entering randomisation, they were excluded from the sample.

## Outcome measures

### Primary outcome

The primary outcome measure was pupil attendance at tutoring sessions. This was calculated by dividing the number of session hours *attended* by the number of session hours bought for that pupil. This outcome measure was chosen for the following reasons:

- Importance for learning. Due to this being a nimble trial, there was neither time nor capacity to use an outcome measure that assessed learning directly. However, attendance at tutoring sessions is essential for pupils to receive any of the benefits from tutoring and is therefore an important intermediate outcome.
- Ease of collection. Attendance data is routinely collected after every session by the TPs. Importantly, collecting it did not create an additional process for TPs.
- High quality objective data. The pupil attendance rate is an objective measure. Given the simplicity of recording, the quality of data is typically high.
- Alignment to TP Key Performance Indicators (KPIs). The TPs participating in the trial were particularly interested in targeting the pupil attendance rate as this was one of their KPIs throughout the NTP.

The attendance data was collected by the TPs individually and shared with NFER at the end of the trial period.

## Sample size

### Sample at randomisation

In total, 1,714 tutor IDs were provided to BIT by TPs and were randomised into one of the two groups between 18 February and 28 May 2021 (858 in control, 856 in the intervention). The final dataset provided by NFER for analysis on 22 December 2021 contained a total of 1,663 tutor IDs from the relevant TPs (51 IDs fewer than the ones randomised as some were duplicates; see below).

### Going from the sample at randomisation to the sample at the analysis stage

The dataset compiled by NFER for the analysis included 4,290 tutors IDs—tutors who were involved across two NTP projects with BIT, of which 1,663 were involved in this trial. However, NFER informed BIT that a minority of these IDs were duplicates, around 3%.<sup>4</sup> These tutors appeared in more than one 'randomisation batch' with different IDs, hence had been randomised more than once by BIT, and five of which, in this trial, were randomised into two different trial arms. Conversations with the relevant TPs clarified that this has been an implementation oversight on the tutoring partners' behalf. Importantly, it was assessed that this issue occurred at random and that the tutors that were randomised in multiple batches were not meaningfully different from those who were not. Due to this being viewed as having occurred at random, and only for a very small number of participants, it was decided that it would

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<sup>4</sup> These duplicates were across this trial and the RCT Connecting With Pupils that BIT and the EEF ran with other TPs in the same period.

be valid to retain the first instance of these tutors and remove their second randomisation for the analysis, in line with an intention to treat (ITT) approach. For this reason, for each of the five tutors with more than one treatment allocation, only the instance that entered randomisation first was kept.

The resulting dataset had 1,657 uniquely identified tutors. Of these, 871 could not be matched to any pupils' records. Based on conversations with NFER, it is BIT's understanding that these tutors were never assigned to give any tutoring sessions. In agreement with the EEF, these tutors were excluded from the analysis.

The resulting dataset consisted of 786 tutors that successfully matched the pupils assigned to their tutoring classes. In accordance with the trial protocol, observations for pupils that had started their first tutoring session on or before 1 February 2021 were removed, reducing the total number of tutors to 702.

Of the pupils that were assigned to these tutors, 64 had never had any tutoring sessions bought for them by their schools (~0.001%) so they were also dropped from analysis as they had no attendance data to be used for the outcomes in the analysis. As a consequence, one tutor was also dropped as they did not have any pupils with valid tutoring sessions, leaving 701 tutors in the sample. No pupils had missing data for hours of tutoring attended.

*Following this, the final sample to be used for the impact evaluation consisted of 701 tutors and 8,922 pupils.*

It should be noted that this is approximately half of the sample randomised. It appears that most of the loss in sample occurs due to tutors not being matched with pupils. This was also reflected in conversations with TPs who noted the significant time lag between a tutor being recruited and then being matched with pupils. TPs noted that it was likely that some tutors recruited during the trial period, and therefore randomised, would not be matched with pupils during the trial period.

At the trial protocol drafting stage, it was expected that 47% of pupils receiving tutoring classes across the NTP received Pupil Premium (PP) funding, based on EEF estimates. The proportion of PP pupils in the trial was similar to that of the estimate, at 45% (or 49% if cases where PP status was missing were excluded).

Based on historical data provided by the TPs, the expected attendance rate was approximately 74%. However, the mean attendance for the sample in this trial was lower (63%). This may be for several reasons, for example that attendance decreased as the term progressed (66% for those starting tutoring on or before 1 May 2021, 60% for those starting after this date). It is possible that the group of pupils targeted by the NTP differed from those targeted by schools and the TPs in previous years. It is also likely that the lower attendance rate is at least partly explained by the circumstances during the trial period—in particular the impact of COVID-19 and associated disruption in schools. The standard deviation of raw attendance (32%) was similar to the one estimated using other TPs' data at the trial protocol drafting stage (28%).

In the trial protocol, it was agreed that a five percentage point increase in the pupil attendance rate would constitute a substantive effect size for this intervention. This assessment was informed by the prior evidence for the intervention and typical effect sizes observed for light-touch behavioural interventions in education. The analysis was powered to detect such a change both in the primary analysis (overall effect) and in the secondary analysis (PP subsample) (see Table 4).

Table 4: Minimum detectable effect size at different stages

|                      | Protocol  |           | Analysis |                              |
|----------------------|-----------|-----------|----------|------------------------------|
|                      | Overall   | PP/FSM    | Overall  | Pupil Premium (PP) subsample |
| MDES                 | 2.1%–3.7% | 3.1%–5.3% | 4.3%     | 4.9%                         |
| ICC                  | 0.2–0.7   | 0.2–0.7   | 0.37     | 0.39                         |
| Alpha                | 0.05      | 0.05      | 0.05     | 0.05                         |
| Power                | 0.8       | 0.8       | 0.8      | 0.8                          |
| Average cluster size | 23.00*    | 23.00*    | 12.73    | 6.39                         |

|                  |              |        |                    |       |                  |
|------------------|--------------|--------|--------------------|-------|------------------|
| Number of tutors | Intervention | 660    | 660 <sup>†</sup>   | 362   | 330 <sup>‡</sup> |
|                  | Control      | 660    | 660 <sup>†</sup>   | 339   | 302 <sup>‡</sup> |
|                  | Total:       | 1,320  | 1,320 <sup>†</sup> | 701   | 632 <sup>‡</sup> |
| Number of pupils | Intervention | 14,295 | 12,150             | 4,412 | 2,026            |
|                  | Control      | 14,295 | 12,150             | 4,510 | 2,014            |
|                  | Total:       | 28,590 | 24,300             | 8,922 | 4,040            |

\* This ranges from 10 to 49 depending on the TP.

<sup>†</sup> Assuming that every tutor has at least one pupil eligible for Pupil Premium.

<sup>‡</sup> The number of tutors with at least one pupil included in the subsample that are eligible for Pupil Premium.

## Randomisation

A rolling (batch) randomisation approach was used in this trial whereby tutors were assigned to a treatment once they had been trained by the TP. Every fortnight, the TPs collated a list of tutors that had been newly inducted in the previous two-week period and generated a list of unique 'BIT-IDs' for each tutor. This list of anonymised BIT-IDs was then sent to BIT for randomisation. In Appendix E, we provide a summary of how many tutors were randomised for each TP in each fortnightly batch.

For each batch of randomisation, researchers at BIT used the statistical software R to first stratify tutors at the TP level and to then randomise at the tutor level (that is, all pupils paired with the same tutor were allocated to the same condition, treatment or control). The full process followed by the researcher was:

- for each batch from each tutoring partner, the data was loaded into R;
- set a new seed of R's random number generator, and sort seed;
- generate a random number from a uniform distribution (0 to 1); each tutor then assigned a random number from 0 to 1;
- sort the tutors according to this random number from lowest to highest;
- assign the first N/2 tutors in the list to the treatment group and the remaining N/2 to the control group;
- where the batch contained an odd number of participants, Nth participant was allocated to the arm, treatment or control, that had the fewest people in it so far (starting from the TPs as ranked in alphabetical order: Manning's Tutors, Schools Partnership Tutors, The Tutor Trust, Tute); if there was a tie, a second random number was generated from a uniform distribution (0 to 1) and the Nth participant was allocated to the treatment group if  $\text{rand.num} < 0.5$ , and to the control group if otherwise.

BIT researchers were not blinded to group allocation while conducting the analysis (they knew which arm each pupil in the dataset was allocated to). While it is the case that BIT developed the intervention and also evaluated it, the risk of researcher bias was determined to be minimal. This was due to the data being provided by NFER with BIT researchers having no way of influencing this, there being no financial or other benefits at stake, and that the pre-analysis plan was put in place and executed as intended. Furthermore, a second independent analyst re-analysed the trial under blind allocation of treatment groups to quality assure results. The results of that blinded re-analysis replicated the results of the primary, secondary, and exploratory analysis.

## Statistical analysis

The primary analysis was analysed with an intention to treat (ITT) approach. This means that outcomes were analysed on the basis of the groups that tutors and pupils were randomly allocated to, regardless of their compliance with the intervention.

The covariates used in the analysis model included the stratifiers and a range of variables that could influence the pupils' attendance, such as specific aspects of the pupil's profile (for example, age group) and specific aspects of the tutor's profile (such as gender and experience). Following the trial protocol, all planned covariates were checked for missing data pre-analysis and those with missingness greater than 5% were removed from the model. This applied to PP status (7.9%) and SEND status (12%). A full list of the control variables can be found in Table 5. Controlling for these variables increased the precision of our estimates, and the approach is consistent with the analytical approach used in the other Reach and Engagement trials commissioned by the EEF.

A fixed-effect model controlling for the interaction between tutoring partner and batch was used (see Appendix E for more details).<sup>5</sup>

Table 5: Impact analysis summary

| RQ             | Sample                                       | Dependent variable               | Independent variable                                                                                 | Control variable(s)                                                                                                                                                                 | Analytical method     | Interpretation                                                        |
|----------------|----------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------------|
| RQ1<br>(Prim.) | All pupils with suitable tutoring start date | Tutoring attendance (percentage) | Treatment assignment, where treatment is clustered at the tutor level and stratified by TP and batch | <b>Pupils:</b> <sup>6</sup><br>year group; main subject of tutoring<br><br><b>Tutors:</b><br>gender; experience;<br><br><b>Stratification variables:</b><br>tutoring partner*batch; | OLS linear regression | The intervention affects attendance rate by X percentage Test points. |
| RQ2<br>(Sec.)  | As above, but restricted to pupils on PP     |                                  |                                                                                                      | same as for RQ1                                                                                                                                                                     |                       |                                                                       |

## Implementation and process evaluation

The study included a light-touch implementation and process evaluation (IPE) that was based on the EEF's latest IPE guidance.

### Quantitative methods

To better understand delivery implementation, researchers collected the completion rates, including partial completion rates, of the intervention. The completion rate provided a measure of compliance with the intervention and the partial completion rates provided a measure of reach. These descriptive statistics were collected directly from the survey platform.

<sup>5</sup> Hence, the analysis exploited the within-TP-and-randomisation-batch variation in treatment assignment to measure the impact of the intervention. This is consistent with the type of inference made that does not attempt to extrapolate beyond the sample recruited for this trial (see **Limitations** for more details).

<sup>6</sup> NFER obtained a set of pupil characteristics from the NPD and a set from tutoring partners. Given the timeline of the project, we were unable to access the set of variables (including pupils' gender) that NFER obtains from the NPD. Because this is an RCT, this only marginally affected power (in that gender may have explained part of the variation of the outcome) but it did not affect the internal validity of our treatment effect estimates.

## Qualitative methods

The impact evaluation was enhanced by a qualitative exploration of implementation, perceived outcomes, and mechanisms of change. A case study approach was used, which involved the gathering of multiple perspectives from multiple sources. Four case studies were conducted, one for each of the TPs in the trial. Each case study consisted of interviews with tutors and an interview with at least one member of staff from the TP. The final achieved sample was:

- Tute: two TP staff interviews, three tutor interviews;
- The Tutor Trust: one TP staff interview, two tutor interviews;
- Manning's Tutors: one TP staff interview, two tutor interviews; and
- Schools Partnership Tutors (SPT): one TP staff paired interview, two tutor interviews.

### *TP interviews*

Semi-structured interviews were conducted with individual staff members from three TPs. Upon SPT's recommendation, a paired interview was conducted with two members of staff. The interviews took place online, lasted around 30 minutes, and focused on the intervention setup, aims of the intervention, and barriers and facilitators to successful delivery. For each TP, the interview took place with the staff member deemed to be closest to the delivery of the intervention. The topic guide was developed using the research questions and in collaboration with the intervention team (see Appendix H for Topic Guide).

### *Tutor interviews*

Semi-structured interviews were conducted with a total of nine intervention tutors from across the four TPs. Five 30- to 45-minute interviews were conducted with tutors who started or completed the survey focusing on their perspectives about the suitability of the activity, their experience of completing the survey, the experience of administering the survey to pupils, perceived outcomes, and suggestions for improvement to the intervention. Four 30- to 45-minute interviews were also conducted with intervention tutors who had not started the survey, focusing on barriers to uptake and their suggestions for improvement to the intervention. The interview participants were purposefully selected to represent diversity in their years of experience and their number of tutees. The tutors were recruited by the TPs as gatekeepers who sent out recruitment materials to tutors who fit the initial sample criteria. Due to low uptake from two of the TPs (SPT and Manning's Tutors), sampling criteria were relaxed to include any willing tutor participants. The topic guide was developed using the research questions and in collaboration with the intervention team (see Appendix H for Topic Guide).

### *Qualitative analysis*

The interviews were first transcribed and then uploaded and analysed in NVIVO. Data was analysed using Braun and Clarke's (2006) six-step approach to thematic analysis, which involved coding the data and identifying emerging themes. Themes underwent a further round of classifying and were sorted into high-level themes and sub-themes.

The predetermined topics of the interview were used to interrogate the data. During the analytical process a balance between deduction (using existing knowledge and the research questions to guide the analysis) and induction (allowing concepts and ways of interpreting experience to emerge from the data) was maintained, and researcher bias was mitigated by a combination of having multiple researchers code the same data and through an analysis meeting designed to reach agreement among the team.

Table 6 provides an overview of the IPE methods.

Table 6: IPE methods overview

| Research methods | Data collection methods                                                                                                                                                                                                                                                                     | Participants/data sources (type, number)                                                                  | Data analysis methods                       | Research theme addressed                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------|
| Quantitative     | Survey/Webapp data:<br>number of tutors who completed the survey and had at least one pupil complete the survey;<br>number of tutors who completed the survey;<br>number of pupils who completed the survey;<br>average agreement scores; and<br>time spent on the survey by tutors/pupils. | Delivery partners.                                                                                        | Quantitative methods (descriptive analysis) | Compliance; reach; fidelity; and mechanisms. |
| Qualitative      | Semi-structured interviews.                                                                                                                                                                                                                                                                 | Five TP staff; five tutors who completed the activity; and four tutors who did not complete the activity. | Thematic analysis                           | Quality; fidelity; and mechanisms.           |
| Qualitative      | Semi-structured paired interview.                                                                                                                                                                                                                                                           | Two TP staff.                                                                                             | Thematic analysis                           | Quality; fidelity; and mechanisms.           |

## Deviations from the trial protocol

### Sample selection

In the trial protocol, BIT had not specified how to deal with tutors who were randomised into the trial but had not been assigned any pupils. In agreement with the EEF, BIT decided to exclude such tutors from the analysis ( $n = 871$ ). When the NFER compiled the final dataset for the analysis, it also informed BIT that a minority of these IDs were duplicates ( $\sim 0.009\%$  amongst those tutors relevant to this trial). These tutors appeared in more than one 'randomisation batch' with different IDs, hence had been randomised more than once by BIT. Conversations with the relevant tutoring partners clarified that this had been an implementation oversight on the tutoring partners' behalf, and that BIT could assume that this happened at random. For each of the tutors with more than one treatment allocation, BIT kept only the copy that entered randomisation first. Whenever tutors appeared to have been randomised more than once within the same batch, one observation was retained for each at random.

### Outcome definition

NFER communicated to BIT that the two variables used to construct the outcome (sessions bought and sessions attended) were expressed as number of hours instead of number of sessions. For this reason, the interpretation of the final outcome was 'proportion of hours of tutoring attended' instead of 'proportion of tutoring sessions attended'.

### **Exploratory CACE analysis**

The trial protocol did not specify the use of CACE analysis; as compliance was only measured at the aggregate level (as the number of tutors that completed the online activity) and as non-compliance was one-sided, Bloom's formula was used to assess the effect of the intervention on those that engaged fully with the materials.<sup>7</sup>

### **Exploratory tutoring provider analysis**

The trial protocol did not specify exploratory analyses by TPs. These analyses were conducted using a model similar to the primary analysis model but with the subsamples of tutors from each of the four providers involved in this trial (see Appendix E for more details).

### **Exploratory tutoring experience analysis**

The trial protocol did not specify exploratory tutoring experience analysis. This analysis was conducted using a model similar to the primary analysis model but with the subsample of tutors with varying degrees of tutoring experience (see Appendix E for more details).

### **Fidelity definition**

It was intended that fidelity measures would be calculated based on how many tutors spent at least ten minutes completing the activity. Unfortunately, the platform was only able to detect whether tutors completed or partially completed the activity without any reference to a specific amount time. As these metrics helped estimate the compliance and reach, fidelity has now been explored through qualitative methods.

### **IPE tutor sample**

It was intended that three tutors from each TP would be interviewed. However, only one TP was able to recruit three tutors and achieve the proposed sample. The other three providers had lower uptake of tutor responses to the interview recruitment materials, each only securing two tutors who were willing to be interviewed, resulting in a total of nine tutor interviews instead of the intended 12.

### **IPE tutor interviews**

The original intention was to interview eight tutors (two per TP) at two timepoints. Difficulties in recruitment and busy workloads for tutors resulted in poor uptake initially and, due to this, it was decided that tutors would be interviewed at a single timepoint toward the end of the programme. This meant that tutors would be able to comment on their entire experience of the intervention.

### **IPE tutorial observations**

The original intention was to obtain eight video recordings of tutorial sessions. TPs initially expressed concerns over data protection and the pupils' ability to consent (along with their caregivers). While this was being discussed, BIT researchers were also becoming concerned about potentially low uptake of the intervention among the treated tutors (this later transpired to be a denominator issue, with uptake of the intervention appearing low as a percentage of the number of tutors randomised, but reasonable once viewed as a percentage of the number of tutors that actually delivered tutoring). It was agreed with the EEF that instead of pursuing observations, BIT researchers would instead interview tutors from the treatment group who had not participated in the survey activity in order to learn about the barriers to intervention uptake.

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<sup>7</sup> Using formula [6]  $t_c = t/\pi_c$  from Hesser (2020; derived from Bloom, 1984) whereby  $t_c$  is the estimated effect of the intervention for those that complied,  $t$  is equal to the estimated overall mean effect and  $\pi_c$  is the rate of compliance (% of tutors in the intervention group that had been recorded as completing the materials provided).

## Findings

Table 7 Summary of findings

| Research question                                                                                                                                       | Finding                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Does an online activity seeking to leverage similarities between tutors and pupils increase pupils' attendance at tutoring sessions?                    | Pupils in the treatment arm had an attendance rate at tutoring sessions that was 4.2pp (95% CI: 1.5pp, 6.8pp) higher than those in the control group, meaning that the relationship-building activity performed better than the tutoring providers' 'business as usual'. This is a meaningful effect, which is in line with other successful educational interventions aiming to change real-world behaviours.                                         |
| Does an online activity seeking to leverage similarities between tutors and pupils increase Pupil Premium (PP) pupils' attendance at tutoring sessions? | Pupil Premium pupils in the treatment arm had an attendance rate at tutoring sessions that was 2.6pp (95% CI: -0.004pp, 5.6pp) higher than those in the control group, meaning that the relationship-building activity performed better than the tutoring providers' 'business as usual'.                                                                                                                                                              |
| Compliance                                                                                                                                              | Sixty-eight percent of tutors were reported to have partially completed the intervention (defined as completing the online tutor survey); 21% were reported to have fully completed the intervention (defined as completing the online survey and having at least one associated pupil survey response also recorded).                                                                                                                                 |
| Balance                                                                                                                                                 | Based on the balance checks there is no reason to suspect that randomisation failed.                                                                                                                                                                                                                                                                                                                                                                   |
| Attrition                                                                                                                                               | Tutor attrition of 58% was observed from randomisation to analysis. This was mainly because some tutors were randomised but were not assigned any pupils in the time period used for analysis (871 of the 1,013 tutors for which we observe attrition). The level of attrition across the intervention and control groups was consistent and there is no reason to see this attrition as causing bias.                                                 |
| Process evaluation: implementation and fidelity                                                                                                         | TPs implemented the activity as described. There was some evidence that tutors adapted the intervention for use with their pupils. Common adaptations included (1) shortening the activity by verbally asking pupils the questions, (2) tailoring the content to younger pupils by picking out selected questions, and (3) discussing the questions verbally where there was limited access to technology (for example, during face to face sessions). |
| Process evaluation: outcomes                                                                                                                            | Interviews were conducted with programme staff at the TPs (n = 4) and with tutors (n = 9). These indicated that tutors perceived the intervention to improve pupil-tutor relationships, which, in turn, improved pupil attendance and attainment.                                                                                                                                                                                                      |
| Process evaluation: formative findings                                                                                                                  | The main formative finding is to develop an improved version of the intervention that has greater adaptability, allowing tutors to tailor the questions and content to pupils of varying ages.                                                                                                                                                                                                                                                         |

## Attrition

As reported in the Sample Size section, the analytical sample includes 701 tutors, 957 less than the total number of tutors randomised ( $n = 1,714$ ). The primary reason for this is that some tutors randomised into the trial were not assigned any students within the timeframe of data collection and did not deliver tutoring sessions in the specified timeframe. These tutors were excluded from the analysis.

Table 8: Attrition from the trial—in terms of number of tutors, the randomisation unit

|                                                     |            | Intervention | Control | Total |
|-----------------------------------------------------|------------|--------------|---------|-------|
| Number of tutors                                    | Randomised | 858          | 856     | 1,714 |
|                                                     | Analysed   | 339          | 362     | 701   |
| Tutor attrition<br>(from randomisation to analysis) | Number     | 519          | 494     | 1013  |
|                                                     | Percentage | 60.5%        | 57.7%   | 59.1% |

In the final sample used for analysis, there were no missing values for the primary outcome (attendance rate). PP status was missing for 8% of pupils, SEND status for 12% of pupils, year group for 5% of pupils, and tutor experience was missing for 1.3% of tutors.

## Participant characteristics

Table 9 provides a cross-tabulation for all covariates included in the analysis across control and treatment groups and variables that were originally specified as covariates but removed from the model due to missingness.<sup>8</sup> The absolute difference in proportions across arms is always relatively small so the randomisation is considered to be well-balanced and successful.

Table 9: Balance check

Note: each cell represents the number and proportion of pupils, not tutors.

|                                | Control      | Treatment    | Total        |
|--------------------------------|--------------|--------------|--------------|
| % in Year 10                   | 1011 (22.4%) | 1041 (23.6%) | 2052 (23.0%) |
| PP                             | 2014 (44.7%) | 2026 (45.9%) | 4040 (45.3%) |
| SEND                           | 754 (16.7%)  | 625 (14.2%)  | 1379 (15.5%) |
| Maths main subject of tutoring | 2216 (49.1%) | 1855 (42.0%) | 4071 (45.6%) |

<sup>8</sup> We do not report balance for the fixed effect batch\*TP in the table.

|                                  |              |              |              |
|----------------------------------|--------------|--------------|--------------|
| English main subject of tutoring | 1703 (37.8%) | 2027 (45.9%) | 3730 (41.8%) |
| Science main subject of tutoring | 389 (8.6%)   | 370 (8.4%)   | 759 (8.5%)   |
| Female tutor                     | 3139 (69.6%) | 3145 (71.3%) | 6284 (70.4%) |
| Manning's Tutors                 | 1435 (31.8%) | 1408 (31.9%) | 2843 (31.9%) |
| School Partnership Tutors        | 1267 (28.1%) | 1458 (33.0%) | 2725 (30.5%) |
| The Tutor Trust                  | 1153 (25.6%) | 1124 (25.5%) | 2277 (25.5%) |
| Tute Education                   | 655 (14.5%)  | 422 (9.6%)   | 1077 (12.1%) |
| Batch 1                          | 3320 (73.6%) | 3184 (72.2%) | 6504 (72.9%) |
| Batch 2                          | 271 (6.0%)   | 286 (6.5%)   | 557 (6.2%)   |
| Batch 3                          | 264 (5.9%)   | 300 (6.8%)   | 564 (6.3%)   |
| Batch 4                          | 229 (5.1%)   | 334 (7.6%)   | 563 (6.3%)   |
| Batch 5                          | 152 (3.4%)   | 136 (3.1%)   | 288 (3.2%)   |
| Batch 6                          | 151 (3.3%)   | 82 (1.9%)    | 233 (2.6%)   |
| Batch 7                          | 88 (2.0%)    | 41 (0.9%)    | 129 (1.4%)   |
| Batch 8                          | 35 (0.8%)    | 49 (1.1%)    | 84 (0.9%)    |

Note: the number of tutors assigned to the treatment and the control groups is provided in Table 6.

## Outcomes and analysis

### Primary analysis

*There is evidence that the treatment performed better than the control in terms of impacting pupil attendance.* The attendance rate for the full analytical sample was 63.4% (SD 32%); for the intervention group it was 65.3% (SD 32%) and for the control group, 61.5% (SD 31.9%). Compared to the control group, the pre-specified model found a difference of 4.2 percentage points (95% CI: 1.5pp, 6.8pp; Hedges'  $g = 0.119$ ) for the intervention, which is statistically significant at conventional significance levels.

On average, pupils attended more than half of the sessions originally bought by the schools. The missed sessions may have been for a variety of reasons, ranging from a possible TP effect (different TPs have different attendance rates) to schools re-assigning some tutoring sessions to other pupils.

### Secondary analysis

*There is evidence that the treatment performed better than the control in terms of impacting pupil attendance for PP pupils.* The secondary analysis focused on the tutoring attendance rate for the PP subgroup. The attendance

rate for the full analytical sample of PP pupils was 60.9% (SD 32.1); for the intervention group it was 62.3% (SD 32.6) and for the control group it was 59.5% (SD 31.6).

When restricting the sample to PP pupils only, the pre-specified model finds a difference of 2.6 percentage points (95% CI: -0.004pp, 5.6pp; Hedges'  $g = 0.087$ ) for the intervention compared to the control group, and this effect was statistically significant at the 10% level.

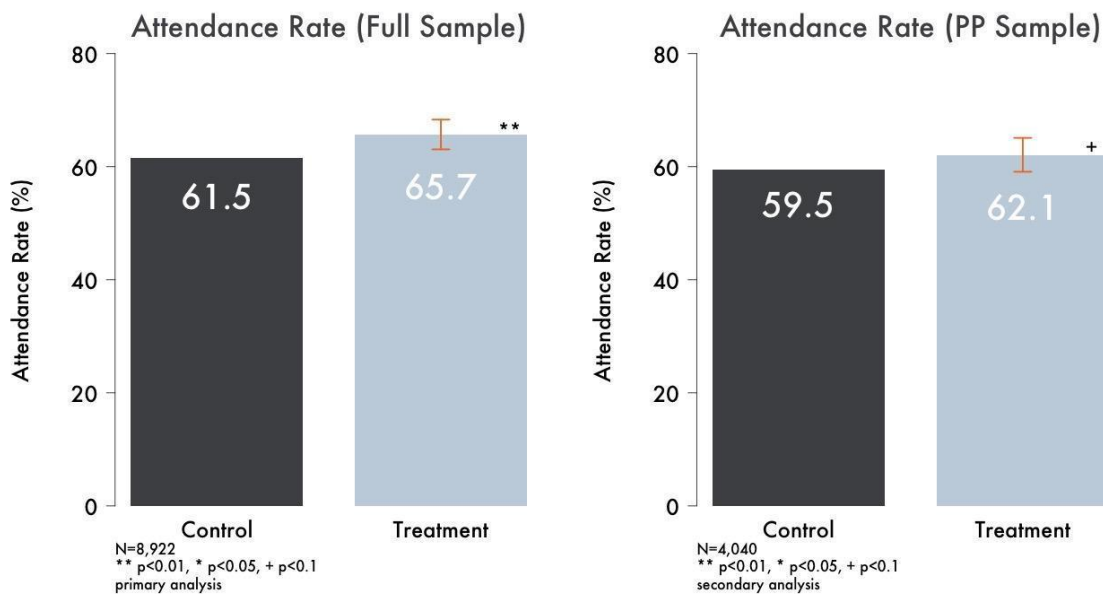
Table 8: Primary and secondary analyses

|                                       | Unadjusted means     |                        |                      |                        | Effect size             |         |
|---------------------------------------|----------------------|------------------------|----------------------|------------------------|-------------------------|---------|
|                                       | Intervention group   |                        | Control group        |                        |                         |         |
| Outcome                               | Pupil n<br>(tutor n) | Mean<br>(95% CI)       | Pupil n<br>(Tutor n) | Mean<br>(95% CI)       | Hedges<br>g<br>(95% CI) | p-value |
| Primary<br>outcome                    | 4412<br>(362)        | 65.3%<br>(64.3%–66.3%) | 4510<br>(339)        | 61.5%<br>(60.6%–62.5%) | 0.12<br>(0.08; 0.16)    | 0.002   |
| Secondary<br>outcome, PP<br>subsample | 2026<br>(330)        | 62.3%<br>(60.9%–63.7%) | 2014<br>(302)        | 59.5%<br>(58.1%–60.9%) | 0.09<br>(0.02; 0.15)    | 0.092   |

Figure 4: Bar graphs for treatment effect of the intervention (i) among the full sample (primary analysis) and (ii) PP subsample (secondary analysis)

(i)

(ii)



Note: Attendance rate in the treatment group is adjusted for year group, main subject of tutoring, tutors' gender, experience, and tutoring partner\*batch. Therefore, the treatment bar height represents what would have happened in the control group had they received the intervention (that is, the raw control rate plus the treatment effect).

### Exploratory analysis—CACE analysis

BIT data on tutors' engagement with the intervention show that 68% of tutors had been recorded as completing the materials provided for the intervention.<sup>9</sup> For this reason, additional analysis was carried out to estimate the complier average causal effect (CACE).

Unfortunately, compliance was only measured at the aggregate level: it is not known which tutors or pupils in the treatment group engaged with the intervention and which ones did not. However, as non-compliance was one-sided, Bloom's formula<sup>10</sup> (intention to treat parameter divided by the compliance rate) can be used to assess the effect of the intervention on those that engaged fully with the materials. This finds a 6.2pp (95% CI: 4.2pp, 8.2pp)<sup>11</sup> increase in attendance in the intervention group versus the control group among those that complied with the intervention, which was statistically significant at the 5% level.

### Exploratory analysis—heterogeneous effects by TP

BIT also conducted additional exploratory analysis on the effect of the intervention for each individual TP subgroup. This analysis did find different impacts across TPs: two—The Tutor Trust and Schools Partnership Tutors—evidenced large positive effects (5.4pp, 95% CI: 3.7pp, 7.2pp and 7.2pp, 95% CI: 1.2pp, 13.3pp, respectively) and two—Tute and Manning's Tutors—evidenced negligible effects (0.1pp, 95% CI: -4.8pp, 5.0pp and 1.2pp, 95% CI: -3.3pp, 5.7pp, respectively). This may have been influenced by a range of factors, including whether sessions were delivered face to face or online, how responsive tutors were to messages from their organisation, and the varying composition of the TP's workforce. For example, The Tutor Trust and Schools Partnership Tutors, that evidenced a larger positive impact, typically delivered sessions face to face, which may have made it easier to integrate the activity into sessions. The Tutor Trust also typically recruits university students who are likely to have less

<sup>9</sup> This proportion was calculated taking into account that of the 817 tutors who were due to complete the intervention, 423 never received any pupils and thus were dropped from the analysis.

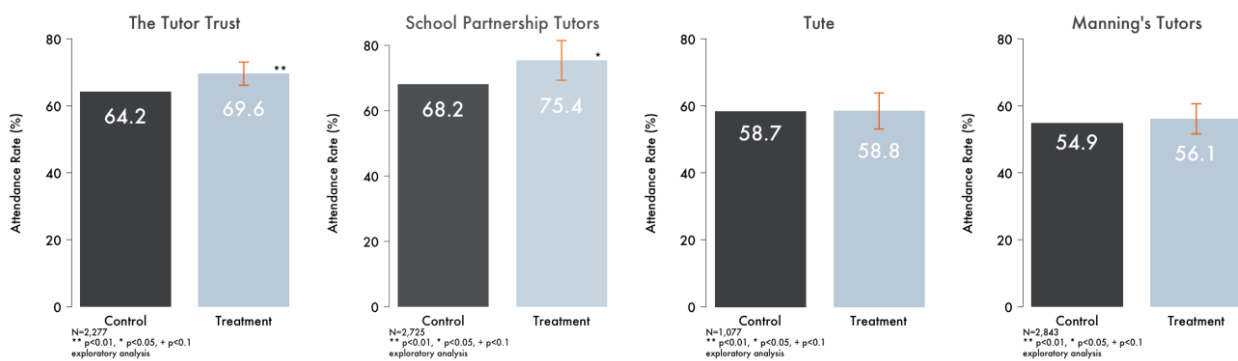
<sup>10</sup> Using formula [6]  $t_c = t/\pi_c$  from Hesser (2020; derived from Bloom, 1984) whereby  $t_c$  is the estimated effect of the intervention for those that complied,  $t$  is equal to the estimated overall mean effect and  $\pi_c$  is the rate of compliance (% of tutors in the intervention group that had been recorded as completing the materials provided).

<sup>11</sup> For reference, the effect was a 4.2 pp (95% CI: 1.4pp, 6.5pp) among the total sample, so the calculation was  $4.2 / 0.68 = 6.17$ .

experience tutoring and may therefore have particularly benefited from a structured relationship-building activity. Schools Partnership Tutors was a new TP, specially set up for the NTP, and it is possible that its 'business as usual' processes were less developed than other TPs, meaning that their tutors particularly benefited from a structured relationship-building activity. Schools Partnership Tutors also encourages schools to use tutors already embedded in their schools, and it is possible that the intervention leveraged these tutors' greater understanding of their pupils' contexts. Tute's tutors, who are typically fully qualified teachers with significant experience, may have been sufficiently experienced for the intervention to have no marginal improvement compared to their normal practices. However, it is important to note that these suggestions are hypotheses and the set-up of this trial does not allow us to reach firm conclusions on what may have led to heterogeneous effects by TP.

Importantly, there is no evidence of the intervention reducing attendance rates across any TP, and the sample of TPs contains a range of 'type' of organisation, which is broadly reflective of the wider tutoring market.<sup>12</sup>

Figure 5: Bar graphs for treatment effect of the intervention for each of the four TPs involved in the trial



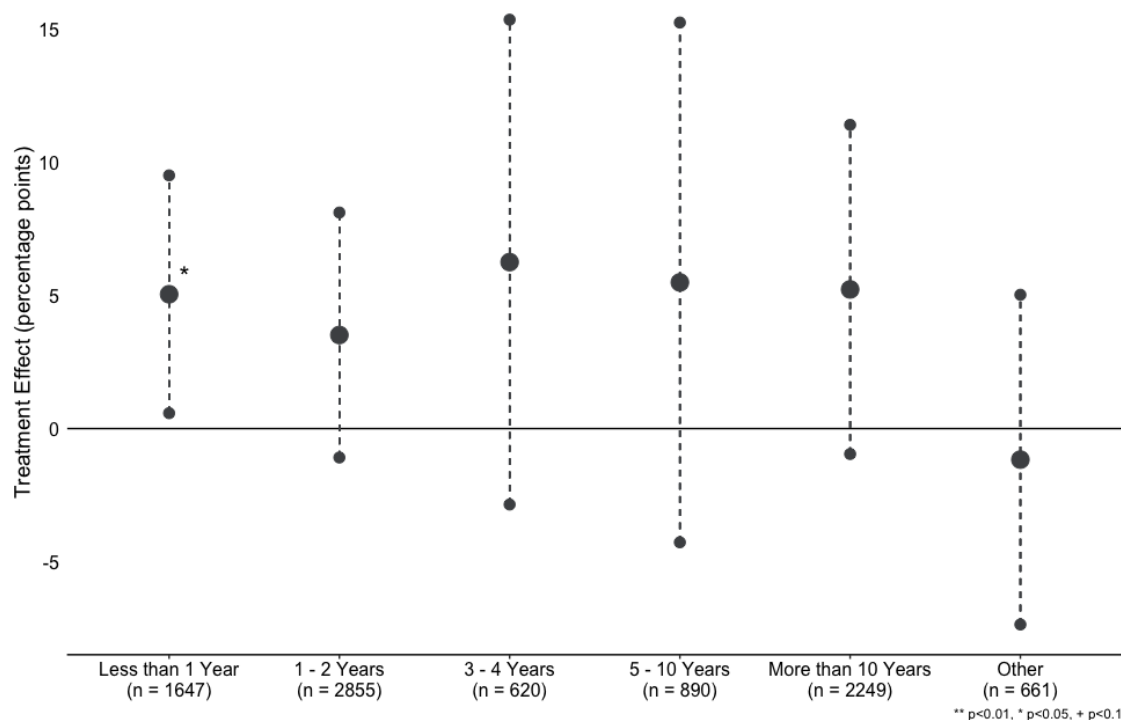
Note: attendance rate in the treatment group is adjusted for year group, main subject of tutoring, tutors' gender; experience, and tutoring partner\*batch. Therefore, the treatment bar height represents what would have happened in the control group had they received the intervention (that is, the raw control rate plus the treatment effect).

### Exploratory analysis—heterogeneous effects by tutor experience

Evidence from the IPE suggested that the intervention may have been particularly effective for tutors with less experience. Further exploratory analysis was conducted to test this hypothesis. Figure 6 provides the treatment effects among tutors with varying levels of experience. The intervention appears to have been effective for tutors with very little experience (less than one year, 5.0pp increase in attendance, 95% CI: 0.1pp, 9.3pp) and was directionally positive for all other subgroups with the exception of tutors that did not specify their previous work experience (that is, they selected the option 'other experience' or did not provide any experience data). However, as sample size varies quite significantly and point estimates are similar across these groups of tutors (1–2 years, 3.5pp; 3–4 years, 6.2pp; 5–10 years, 5.5pp; more than ten years, 5.2pp), this was not considered to constitute sufficient evidence for a clear pattern between the level of experience and the effectiveness of the intervention.

Figure 6: Plot graphs for treatment effect of the intervention for tutors with different levels of experience

<sup>12</sup> Two out of the four TPs in this trial - Tute and Schools Partnership Tutors - typically use fully-qualified teachers or higher-level teaching assistants as tutors, with the other two TPs typically using university students. This compares to approximately 60% of TPs approved for the NTP in 2020/21 using qualified teachers, and 35% drawing on university students. Two of the four TPs in this trial are not for-profit - The Tutor Trust and Schools Partnership Tutors - which compares to approximately 35% of the TPs approved for the NTP in 2020/21. Finally, one of the four TPs in this trial - Schools Partnership Tutors - was newly set up specifically for the NTP, which compares to approximately 13% of TPs approved for the NTP in 2020/21.



Note: each estimate in the graph represents a separate regression by tutors' experience. In each regression, the comparison group to treated pupils consisted of pupils assigned to tutors of the same experience level who were not exposed to the intervention. Attendance rate in the treatment group is adjusted for year group, main subject of tutoring, tutors' gender, experience, and tutoring partner\*batch. The sample size for each group refers to the number of pupils that have tutors in each experience group.

## Implementation

**RQ1 (compliance): What proportion of tutors in the treatment group used the intervention materials and had at least one of their pupils use the materials?**

**RQ2 (reach): How many tutors and pupils completed the survey?**

A total of 394 tutors received the activity and were matched with pupils for tutoring, of which 266 (68%) completed the tutor survey (partial compliance). There were 82 tutor surveys that had at least one associated pupil response (full compliance).

Table 10 details the number of tutors receiving the activity, the full compliance rate, and the partial compliance rate.

Table 10: Descriptive statistics on partial and full compliance.

|                                              | Totals    |
|----------------------------------------------|-----------|
| Number of treatment tutors matched to pupils | 394       |
| Full compliance                              | 82 (21%)  |
| Full and partial compliance                  | 266 (68%) |

Compliance with the intervention by tutors was facilitated by clear and regular communications from TPs. Tutors felt that the information, which included detailed step-by-step guides and video overviews, was clear and easy to understand. Some tutors also noted that the number of reminders received about the intervention encouraged them to try the intervention with their pupils.

*"To be honest, we just got sent it so many times, I thought, well, I might as well give it a go!" (tutor).*

### **RQ3 (quality): How did tutors and TP staff experience the intervention?**

**Feedback from both TPs and tutors that used the intervention was broadly positive**, highlighting the intervention's usefulness for forming strong relationships with pupils. Tutors reported the intervention to be a novel and engaging way to begin the tutoring sessions and relationship-building process as a whole. Tutors and the TPs felt that the questions in the activity were relevant, fun, and presented in an engaging way.

*'It's a novelty thing for them to have answered questions about themselves, rather than starting with assessment objective one, for paper one, question one, or whatever! It's just a little bit different for them, so I think they liked that' (tutor).*

Tutors felt that the survey contributed to the pupil-tutor relationship by stimulating conversation between pupils and tutors which can be difficult, particularly in an online environment. In some cases, **tutors were able to leverage their deeper understanding of pupils to better facilitate pupil progress in sessions in an ongoing way**. The main example of this was incorporating pupils' interests into lesson content, where they used their pupil's favourite films or sports as inspiration for a writing task.

*'So it was easy to see that [football is] something we have in common, so then now, most of my lessons, one task will mention football somehow. So it will be like a picture of a footballer. Let's say he's really angry, and it will be, "Write a metaphor or a simile about this." I try and do that to build the interest in the lesson' (tutor).*

*'Especially for English, it's quite useful because if we're talking about, I don't know, structural devices and the kids have said that they really like a show, and you know that there's, I don't know, a flashback scene or something, you go, "Well, in that show that you like, the structural feature of this that we're talking about is actually used. Do you remember that scene...?" It makes their interest in the subject more relevant because it's related to something that they're already interested in' (tutor).*

**Tutors reported several positive outcomes for themselves and their pupils.** Primarily, tutors commented on the improvement to their relationships with pupils.

*'I think it was nice to know a bit more about what everyone was getting up to. I feel like it did actually help the relationship between me and my students' (tutor).*

Tutors also perceived that attendance at tutoring sessions was improved by the positive tutor-pupil relationship that the intervention helped to facilitate.

*'I think that they definitely make the students possibly more willing to come. All the students that I have that better interaction with seem to be the ones that turn up most to the online lessons' (tutor).*

Some tutors also felt that the intervention itself influenced pupil attainment, beyond just encouraging more pupils to attend sessions.

*'I think when the students feel like we know them a little bit better, they relax a little bit more, they engage a bit better. That's all going to have a positive impact on their progress and, ultimately, their attainment' (tutor).*

**Some tutors perceived the activity to work particularly well for specific groups of pupils, for example, those with SEND.** Tutors noted that SEND pupils often find it harder to open up and engage with teachers and tutors and that the structured activity helped these pupils to share more about themselves and learn more about their tutor.

*'Quite a lot of our students as well may have special educational needs, so they may find it harder to open up and engage in a lesson with somebody that they don't know, so being able to have a teacher that they feel like they understand I think they would academically perform better' (TP).*

*'I think there would probably be a case for children who possibly were on the spectrum because I think establishing relationships with them can be quite hard' (tutor).*

However, **some tutors did note challenges to fully integrating the activity into their sessions.** Tutors commented on the difficulty of transitioning from a fun activity into a learning session. Others also noted the difficulty of having personal, one to one conversations with all pupils, particularly when there were multiple pupils in the lesson.

*'I just didn't like to have those one-on-one conversations—just because I'm normally teaching three students. I don't know, I'm just like, if it was me and someone was having a chat to someone else and I'm meant to be doing these maths, it would just be annoying!' (tutor).*

Tutors and TPs noted challenges to incorporating the activity in both face to face and online sessions. Not all pupils had access to technology during face to face sessions, making it difficult for them to complete the online survey. Despite this concern, some tutors noted the ways in which they adapted the intervention to make it effective in a face to face context. Common adaptations included discussing the questions one by one with pupils or putting a selection of the questions on the tutors' screen so that the pupils could see the questions at the same time. In this way, the spirit of the intervention remained present and still helped to develop the relationship even if the pupils did not formally complete the survey (and just answered the questions during a session). While it may have been easier to complete the survey during online sessions, some tutors and TPs noted that it was harder to have a spontaneous and authentic conversation about mutual interests in an online environment.

Some tutors expressed the view that the activity was particularly suitable for specific groups of pupils but less so for other groups. In particular, some primary school tutors noted that some of the references in the activity were less relevant for their pupils, and in some cases may even have been inappropriate. They noted that younger children are used to seeing tutors as 'authority figures' and that the 'fun' questions may undermine that. In these instances, these tutors noted the ways in which they adapted the intervention, asking the pupils selected questions from the activity and asking them general questions about their interests.

*'I didn't find it particularly appropriate for my Key Stage 1 and 2 students for them to know about me when that really wasn't relevant' (tutor).*

Some tutors with extensive prior teaching experience also noted that they found the activity less useful, likely driven by the fact that they had other relationship-building strategies they could draw on. However, this was not reflected in the quantitative data, which showed that the intervention still improved pupil attendance even for experienced tutors.

Despite the benefits to their relationships, some tutors did raise concerns about the time implications of completing the activity noting that, in some cases, pupils' low reading and comprehension abilities meant they took more time to complete the survey, resulting in less time to complete the learning content.

*'I know that for some it had been an issue because our lessons are 45 minutes; we should really have made them an hour at the beginning' (TP).*

**RQ4 (fidelity): How was the intervention implemented?**

**The implementation process for TPs was light touch and neither demanding nor burdensome.** TPs had a good understanding of what was required of them and felt that BIT had communicated well throughout the process, including clear step by step guides and quick responses to questions or issues. This helped TPs to effectively implement the intervention.

*'I have to say, that the communication from BIT has been so clear. Every meeting that we've had, the way that things have been set out, and the way things have been presented, we've always known at every step what's happening, what's next, why things are happening the way that they are' (TP).*

However, **TPs that did not use a CRM system to automate the sending of emails did find the process to be slightly more difficult**, though this was not reported to have impacted fidelity. TPs took steps to ensure they followed the process correctly, which included:

1. When sending the activity to treatment group tutors, TPs reported using the email templates exactly as provided by BIT and not adding TP branding or further personalisation. One TP commented that this may have impacted engagement, but followed the process as instructed.

*'I followed the comms plan to the letter and didn't send any additional follow-ups that were in more personalised or more Tutor-Trusty language explaining what it was and what it was for' (TP).*

2. Not sending additional reminders or communications beyond those that were prescribed by BIT.

*'We've been told, specifically, not to contact tutors about it because they don't want us to influence the trial ... [BIT team member] originally said he specifically didn't want us to contact them and talk to us about it as it might influence the outcome' (TP).*

However, one TP made a change to the emails sent to its tutors. In its email, a code was added which asked tutors to use the activity only with pupils on the NTP.

*'We adapted the email very slightly to include a little statement to make sure that the teacher knows which lessons to use it in, so by using our code, "2020-21privateNTP" so they'd know which lessons to use this system in' (TP).*

**Tutors did report some deviations from the prescribed delivery in response to contextual factors.** For example, some pupils were unable to complete the activity in face to face sessions due to a lack of access to technology. In these instances, tutors described copying some of the questions onto a slide on their laptop screen or simply asking pupils some of the questions and then having a general discussion about their answers. In other instances, some tutors shortened the activity by going through the questions verbally rather than having all pupils manually complete the online survey. Where tutors had made adaptations, they thought these had had a positive impact on the delivery of the activity.

*'Somehow in my first session I couldn't send my student the link, so we kind of talked through each of the questions, which I found was better than just seeing what we both have in common' (tutor).*

**RQ5 (mechanisms): What were the barriers and facilitators to implementation and delivery? How much similarity did tutors and pupils share on average?**

**Initial usage of the activity facilitated ongoing usage of the activity with a tutor's other pupils.** Tutors that implemented the intervention were, overall, very positive about the activity, which they found to be novel and engaging. These tutors also perceived relationships with pupils to improve and indicated that it may also impact on a pupil's attendance and progress in sessions. This positive perception of the activity encouraged tutors to use the survey with other groups of pupils, particularly with pupils that were perceived to be harder to reach or less engaged.

*'I actually just got a new group this week, and I'm going to do the survey with them the week after. Particularly for a particular student I'm thinking of who isn't that engaged, and I'm trying to figure out why' (tutor).*

**Tutors perceived pupil engagement with the activity to be facilitated by the survey format, content, and aesthetics.** Tutors reported that pupils were engaged in the survey, and that this was likely driven by its similarity to other online quizzes.

*'Their engagement with the tool? I think they largely enjoyed doing it. I think there's an element of, doing online quizzes seems to be something that young people quite enjoy' (tutor).*

**Tutors also felt that engagement was facilitated by the types of questions,** specifically how they helped tutors really get to know their pupils and their interests. Tutors noted that they learnt things about their pupils from the activity that they otherwise would never have learned.

*'The survey had questions—they were really general interest type things, like TV shows they liked or I think there were characters as well. They were just things that we might not necessarily have naturally got to a point of knowing about the students, that they really liked a certain TV show, and then you can build that in' (tutor).*

Further to this, tutors appreciated the range of questions, stating that the variety of topics in the survey meant that there was likely to be something that the pupils would feel comfortable talking about. Tutors also felt the diversity of topics also increased the likelihood that pupils may find some similarity with their tutor. Indeed, engagement data from the website hosting the intervention indicated that, on average, pupils and tutors had 11.9 similarities (out of a total of 24 questions, some of which allowed for multiple matching answers).

*'So I think because there are a variety of topics in the survey, there's bound to be one that they're going to want to speak about, which is good' (tutor).*

Tutors also reported liking the aesthetics of the online survey. One tutor stated that its visual nature, including the use of images, was likely engaging for pupils first encountering the survey.

*'From memory, I think it was quite visual as well, it had some images and stuff, so I think that's nice for the students to have' (tutor).*

While 68% of treatment tutors did complete the activity, **a number of barriers to implementation were identified by tutors.** Some experienced tutors and those with professional teaching experience reported that they already had their own relationship-building techniques and perceived the activity as unnecessary. However, it should be noted that this hypothesis was explored in the data, which found that the intervention still had significant positive effects for tutors with high levels of experience.

*'I thought, well, if it's for me getting to know the students, it was going to be a tool to help me to get to know the students, I'm all right at doing that, so I didn't push it, to be honest' (tutor).*

**Some tutors were also reluctant to implement the intervention due to the perceived length of time to complete the activity.** Tutors felt that it might take too long for some pupils to complete the online survey due to relatively low reading and comprehension abilities. This was exacerbated by some pupils arriving late to sessions, meaning that tutors felt they had to prioritise lesson content and adapt the activity to shorten it.

*'I found that it took longer than the time that it would take, which was what put me off it, because with it being online children show up late anyway, because there's not as much of that school pressure, like get on time. So I found that it was a bit too long to be using in all my online sessions' (tutor).*

In some instances, tutors came under pressure from schools to prioritise lesson content rather than spending time on relationship-building activities. In these instances, tutors described shortening the activity or simply leading a discussion based on the activity instead.

*'I did have one person who did say that the school didn't want them to do it, basically. They said that the school had been a part of the session. I guess they were watching the session and someone in the school said that they didn't want to do that. Basically, I think it was wasting the time doing that when they should be tutoring' (TP).*

**Tutors had mixed views on whether the online tutoring format served as a barrier to effective implementation of the activity.** Tutors remarked that many pupils kept their cameras turned off during sessions and that this was often encouraged by TPs for safeguarding purposes. Some tutors noted that this made it difficult to read the body language of pupils, which may have dampened their ability to successfully implement the activity. However, other tutors found that the activity was actually a helpful remedy to the limitations of online relationship-building. They described how the activity helped to stimulate conversation and dialogue about personal interests that would otherwise have been challenging to facilitate in an online format.

*'Oh, here are some common interests we have; then it can help stimulate conversation, which can be a bit harder online. Yes, so I did find it useful in that sense' (tutor).*

## Formative findings

Tutors made a range of suggestions for further improving the intervention. These include:

1. **Making the surveys more adaptable.** Tutors stated that being provided with an adaptable survey and the ability to remove or add questions would enable them to tailor the survey to cater better for a range of audiences.

*'I think it would have been better to take out some questions, or like for myself to make it a bit more appropriate for them, because I know that if I was to then use it on Year 11s I wouldn't want the same questions asked' (tutor).*

Some tutors also noted that they would like the option to ask questions with a 'greater level of depth', and that this may help to connect with older pupils. For example, one tutor gave the example of whether a pupil is a 'pet person', explaining that this does not really tell you much about them as a person.

*'Knowing that someone's a pet person, 90% of people are pet people. Well, I don't know, maybe that was a bit high! You know what I mean. A little bit more detail might go a little bit—make it a little bit more personal' (tutor).*

It was also suggested by one tutor that in order to be effective over time, the survey would need to be continually and regularly updated to the changing pop culture themes of the intended audiences.

*'I think that it's something that would need to be updated regularly, based on the fact that teenage culture reinvents itself every five minutes' (tutor).*

2. **Allow pupils to enter their name instead of a nickname.** Asking pupils to use a nickname (a choice made in light of GDPR considerations) created some confusion for pupils, so some tutors felt the survey could be improved by asking pupils for their name.

*'Possibly changing the initial nickname thing to just put in your name, because of the slight confusion it caused' (tutor).*

These tutors expressed a desire to reduce as much friction as possible for pupils already at risk of disengaging or not engaging in the first place.

## Control group activity

Standard training for tutors varied across the different providers. For example, The Tutor Trust delivered specific, comprehensive training modules on relationship building and, in particular, how to work with children from disadvantaged backgrounds.

*'Block two ... is all about building relationships, getting to know your tutees. We look at some of the factors that may contribute to educational disadvantage and how they may play out in children and young people's lives. About the importance of the first session in terms of building relationships and getting to know children and young people, asking them questions, learning about their interests' (TP).*

However, despite this, a tutor from The Tutor Trust did note that the training, whilst covering relationship building, did not necessarily equip them with tangible activities and tools to use to build relationships with pupils. It should be noted that the intervention had a significant positive effect for The Tutor Trust, despite the existence of their comprehensive training provided to control group tutors.

*'There wasn't much [in the TP training programme] on how to, let's say, have a good relationship, in terms of giving an activity. So I think this one was something that was needed in there' (tutor).*

Other TPs, such as Tute and Schools Partnership Tutors, employed tutors with much more extensive experience in the tutoring sector. For example, Schools Partnership Tutors noted that 75% of its tutors were qualified teachers and, therefore, were in less need of specific training on how to build relationships with pupils. Schools Partnership Tutors also noted that its newer tutors have often worked in the same schools in a different capacity (for example, as a teaching assistant) and may already have a good relationship with them. However, even with its experienced workforce, the intervention had a significant positive effect for Schools Partnership Tutors.

*'Our core model is that the schools have recommended tutors, so people that are already working in their schools. It might be a teaching assistant that's working part-time doing some additional hours with a smaller group. It could be a part-time teacher doing some additional time. It might be that they've had a supply teacher that comes in regularly that knows some of the pupils. It is slightly different. Those will already have a relationship with those pupils. It's a bit of a different scenario' (TP).*

All Tute tutors undergo a rigorous selection process and then complete a series of online training sessions. The first session for all Tute tutors is observed, and tutors receive feedback on their teaching approach. However, the online training sessions do not specifically cover relationship-building strategies as this is something that is generally expected of Tute tutors. It is also worth noting that Tute refers to all of its tutors as 'teachers'.

*'We haven't done anything specific to build relationships, we just, I suppose, depend on teachers to do that because it's just part of being a teacher' (TP).*

Manning's Tutors requires tutors to complete a series of online training modules, which covers best practice on delivering tutoring, with a particular focus on effective pedagogical approaches. While this training may cover the importance of relationship-building, tutors are given relative freedom to form connections with pupils in whatever way they wish.

*'I would typically tend to leave that up to the tutors. We're, generally speaking, quite hands-off in terms of how the tutor goes about delivering the sessions.' (TP)*

## Conclusion

Pupils in the treatment arm had an attendance rate at tutoring sessions that was 4.2pp higher than those in the control group, meaning that the relationship-building activity performed better than the TPs' 'business as usual' approaches. Pupil Premium pupils in the treatment group also had higher attendance (a difference of 2.6pp) suggesting that the intervention was effective for this subgroup too. Exploratory complier-average analysis calculated a 6.2pp increase in attendance in the intervention group versus the control group among those that complied with the intervention. These findings are also reflected by positive responses from tutors and TPs in the IPE, with tutors noting that the intervention helped them develop stronger relationships with pupils, which, in turn, led to improved attendance rates.

It is estimated that if the control group had received the intervention, approximately 1,600 additional session hours would have been attended by pupils.<sup>13</sup> If the intervention had been scaled across all pupils involved in the NTP during the 2021/2022 academic year, it is estimated that approximately 185,000 additional session hours would have been attended by pupils.<sup>14</sup>

## Interpretation

This trial found evidence that the relationship-building activity delivered to tutors made a significant impact on pupils' attendance rate at tutoring sessions when compared to the TP's 'business as usual' support to tutors.

Findings from the IPE found that tutors that used the intervention were very positive about it, noting that it helped them understand their pupils better. Crucially, tutors commented that after completing the activity with pupils and learning about their interests, tutors were able to link lesson content to these interests, which likely led to ongoing improvements in engagement and attendance. The intervention was perceived by tutors to be particularly effective for harder-to-reach pupils that may struggle to 'open up', such as those with SEND, and in online settings where relationship-building can often be more challenging.

It did appear that there was a differential impact across TPs, with two TPs experiencing large positive effects and two experiencing negligible effects from the intervention. This may have been influenced by a range of factors, including whether sessions were delivered face to face or online, how responsive tutors were to messages from their organisation, and the varying composition of the TP's workforce. For example, The Tutor Trust and Schools Partnership Tutors, which both experienced a larger positive impact, delivered the majority of their sessions face to face during the trial period, which may have made it easier to incorporate the activity into sessions. Schools Partnership Tutors—which experienced the largest positive impact—is a school-led TP that encourages schools to use tutors already embedded in their school, and it is possible that the intervention leveraged these tutors' greater understanding of their pupils' contexts. However, both of these suggestions are speculation. Importantly, there is no evidence that the intervention worsened pupil attendance across any TP.

Interviews with tutors, as part of the IPE, also suggested that the intervention may have been particularly effective for tutors that had less experience. Further exploratory analysis was conducted to test this hypothesis. This found that the intervention appeared to have been effective for tutors with very little experience (less than one year, 5.0pp increase in attendance, 95% CI: 0.1pp, 9.3pp). However, similar point estimates were observed across all groups of tutors with known levels of experience (1–2 years: 3.5pp; 3–4 years: 6.2pp; 5–10 years: 5.5pp; more than ten years, 5.2pp). Given the similar point estimates, and the wide variation in sample size between subgroups, this was

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<sup>13</sup> The 95% confidence interval for this figure is approximately 600 to 2,700. The number of extra sessions is calculated by multiplying the number of pupils in the control group ( $n = 4,150$ ) by the average number of sessions per pupil in the control group (8.8) multiplied by the effect size in the primary analysis (4.2 pp).

<sup>14</sup> The 95% confidence interval for this figure is approximately 66,000 to 300,000; it assumes 500,000 pupils participate in the NTP during the 2021/2022 academic year: <https://nationaltutoring.org.uk/news/tutoring-revolution-builds-as-students-return-to-class/>

not considered to constitute sufficient evidence for a clear pattern between the level of experience and the effectiveness of the intervention.

## Limitations

It was not possible to ensure that every tutor in the treatment group completed the activity. It is estimated that about 68% of tutors in the treatment sample engaged with the activity in some way. Unfortunately, it was not possible to link compliance with the activity with the pupil attendance data. This meant that it was not possible to conduct a two-stage least-squares instrumental variable analysis (in which individual tutors' compliance would have been instrumented with treatment assignment).

At the analysis stage, a small number of implementation errors were identified. These involved TPs incorrectly administering the randomisation in some cases, leading to a small number of tutors being re-randomised into the trial. However, after thorough investigation, this was assessed to only affect less than 1% of the sample for this trial.

Another implementation limitation was that not every randomised tutor was assigned pupils: 871 tutors originally randomised were not assigned any pupils. This did not have a material impact on the analysis as it was still powered to detect a substantive effect even after dropping these tutors.

## Generalisability

When assessing the generalisability of the findings in this trial, it is important to look beyond simple differences in population or setting and seek to understand the intervention's mechanisms of action (Burchett et al., 2020). By doing so, it is then possible to determine whether these mechanisms might, if at all, be enacted in other contexts and settings. The sections below outline the core mechanisms of the intervention and discuss whether they are likely to hold in other contexts and settings.

### **Mechanism one: increased sense of similarity**

The IPE found that the intervention helped to identify similarities between tutors and pupils, increasing the perceived strength of the relationship between tutors and pupils. This was considered to be particularly true for harder-to-reach pupils, such as those with SEND. Findings from the IPE suggested that when pupils perceived the relationship with their tutor to be stronger, they were then more likely to attend the sessions.

The intervention was designed to ensure that it is highly probable for tutors and pupils to identify similarities, and so it is almost certain that the intervention could be used for this purpose in settings beyond the one in this trial. Previous research from other settings has shown that providing information on similarities does increase the perceived strength of relationship between teachers and pupils (Gehlbach et al., 2016) and it is likely that this mechanism will continue to operate in other educational contexts.

### **Mechanism two: leveraging similarities in lessons**

The IPE also found evidence that the intervention helped tutors to understand their pupils' interests better, enabling them to link lesson content to these interests. Findings from the IPE suggested that this in turn helped to improve pupil engagement in sessions, and also improved pupil attendance (as they were more likely to attend sessions they found interesting).

Given the high likelihood of identifying similarities, it is almost certain that tutors in other contexts that use the intervention will build their understanding of their pupils' interests. It is also plausible that tutors will continue to incorporate these interests into sessions—indeed this would be actively encouraged by the ongoing reminders sent to tutors as part of the intervention.

## Contextual factors

Beyond the mechanisms of action, generalisability further depends on various contextual factors relating to implementation of the intervention. This helps us to understand how the intervention might be implemented and experienced in other contexts. First, on composition of the tutor workforce, a wide range of tutors were involved in the trial. Less experienced tutors, such as university students, were used by The Tutor Trust and Manning's Tutors in contrast to Tute's focus on highly experienced and fully qualified teachers and Schools Partnership Tutors' focus on tutors already employed by the school they were working in. The mission and ethos of the TPs also varied: Schools Partnership Tutors and The Tutor Trust are both non-profit, social purpose organisations whereas Tute and Manning's Tutors are for-profit companies. Despite this variation, the intervention either improved attendance or made no difference to attendance across all TPs. This provides some degree of confidence that the intervention works across various tutoring contexts, and that the findings from this study are broadly generalisable to the wider tutoring sector. Regardless, further empirical testing, such as a small scoping study in another context, may be useful to add further confidence to this statement.

## Recommendations

Given this positive result, the absence of a backfire effect for any subgroup, and the minimal burden placed on TPs and tutors, it is recommended that TPs consider incorporating a revised version of the activity that has been updated to reflect the points for improvement identified in the IPE into their standard provision for tutors. Feedback from the IPE suggests that the intervention should be adapted before use with primary pupils, and should provide tutors with the ability to adapt and tailor the activity for their pupils. To maximise the potential effect of the intervention, it is recommended that the activity is completed by tutors and pupils as early on in the sequence of lessons as possible—ideally within the first few sessions.

Based on the findings in this report, there is evidence that the intervention was effective for a wide range of tutors, including those with very little experience and those with lots of experience. As such, it is recommended that all tutors are encouraged to use the activity, even if only in a more limited form, such as using the survey questions as a basis for conversation.

The activity may not be suitable where relationships between tutors and pupils already exist, for example, if the tutor is already working in the school that the pupil attends and is already known to the pupil.

## Future research and publications

Future research in this area could test an improved version of the intervention that incorporates the formative findings from the IPE. In particular, an improved version would make the survey adaptable, allowing tutors to tailor the questions asked for the age group of pupils they are working with.

Future research could also help to tease out some of the mechanisms for impact. For example, with a larger sample size, it would be possible to rigorously explore the potential varying impact of the intervention for tutors with different levels of experience. Further research could also include more tutoring organisations to investigate whether organisational characteristics play a role in the effectiveness of the intervention. Future research could also explore the potential for an intervention like this to improve outcomes out of a tutoring context, for example in teaching assistant-led interventions.

While this trial found evidence that the intervention was effective for PP pupils, further research could also explore whether the intervention is particularly effective for other subgroups of pupils (such as those in particular year groups or receiving tutoring in specific subjects). Additionally, the IPE suggested that the intervention may be particularly useful for SEND pupils, which could be explored empirically.

BIT have developed a revised version of the intervention, informed by the lessons learned from this trial. It is free to use and available [here](#). Supporting materials are also available [here](#). In response to feedback, the revised intervention materials give tutors a choice between using an 'online' or 'offline' version of the intervention (the offline version can be found [here](#)). BIT will also be hosting a webinar on the trial results.

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## Appendix A: Intervention materials

Figure 1: Screenshot of tutor survey



Admin



### Snap Survey: What do you and your pupils have in common?



*You and your pupils after you've done the activity. It will take about 5 minutes.*

1 - Quick fire questions about you

Would you say your hobbies are mainly:

☐ Creative 🎨

☐ Sporty 🏃

☐ Social 🍷

Are you a pet person? 🐶

☐ 100% yes

☐ Absolutely not

Figure 2: Example output after both tutor and pupil complete survey

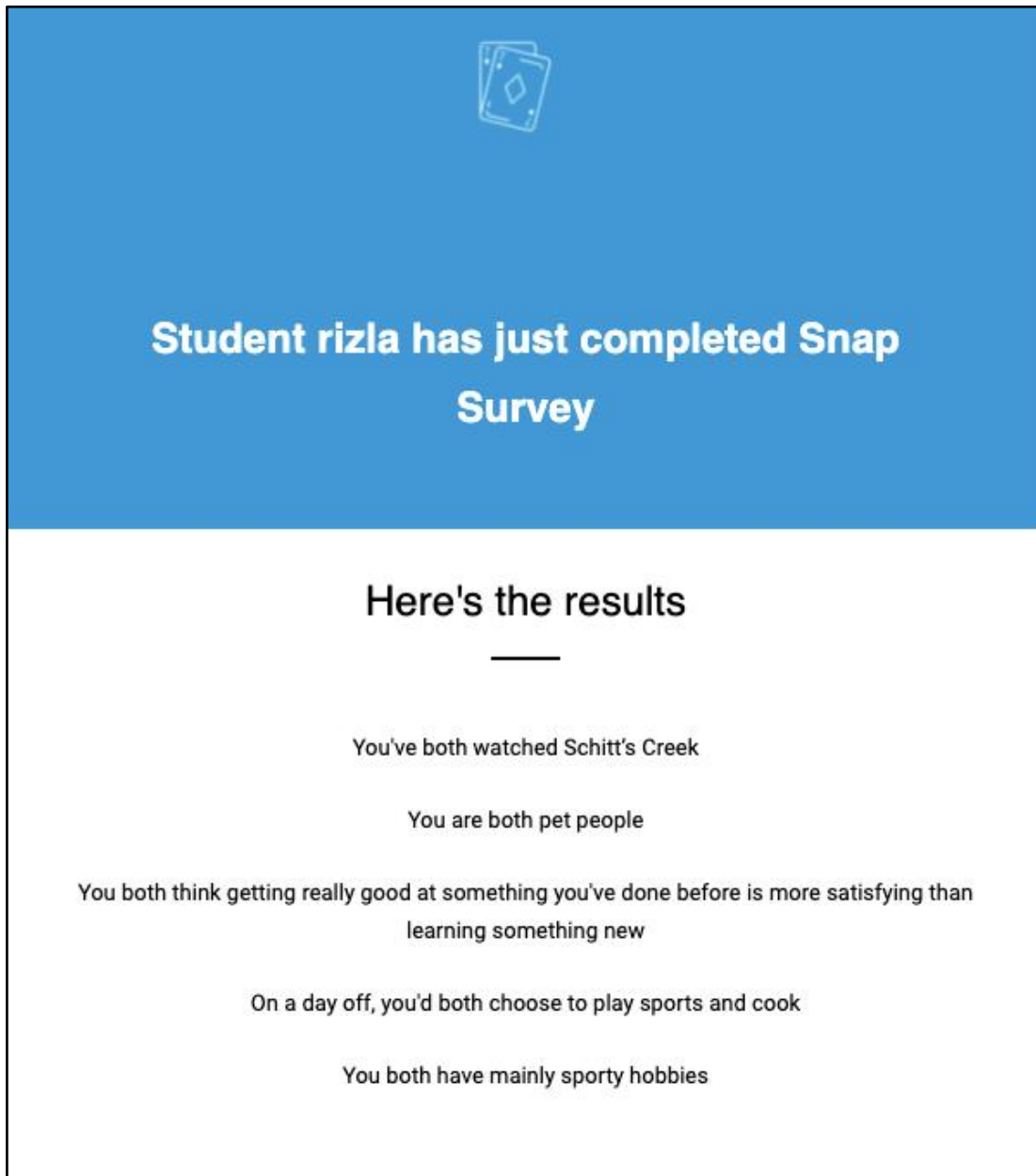
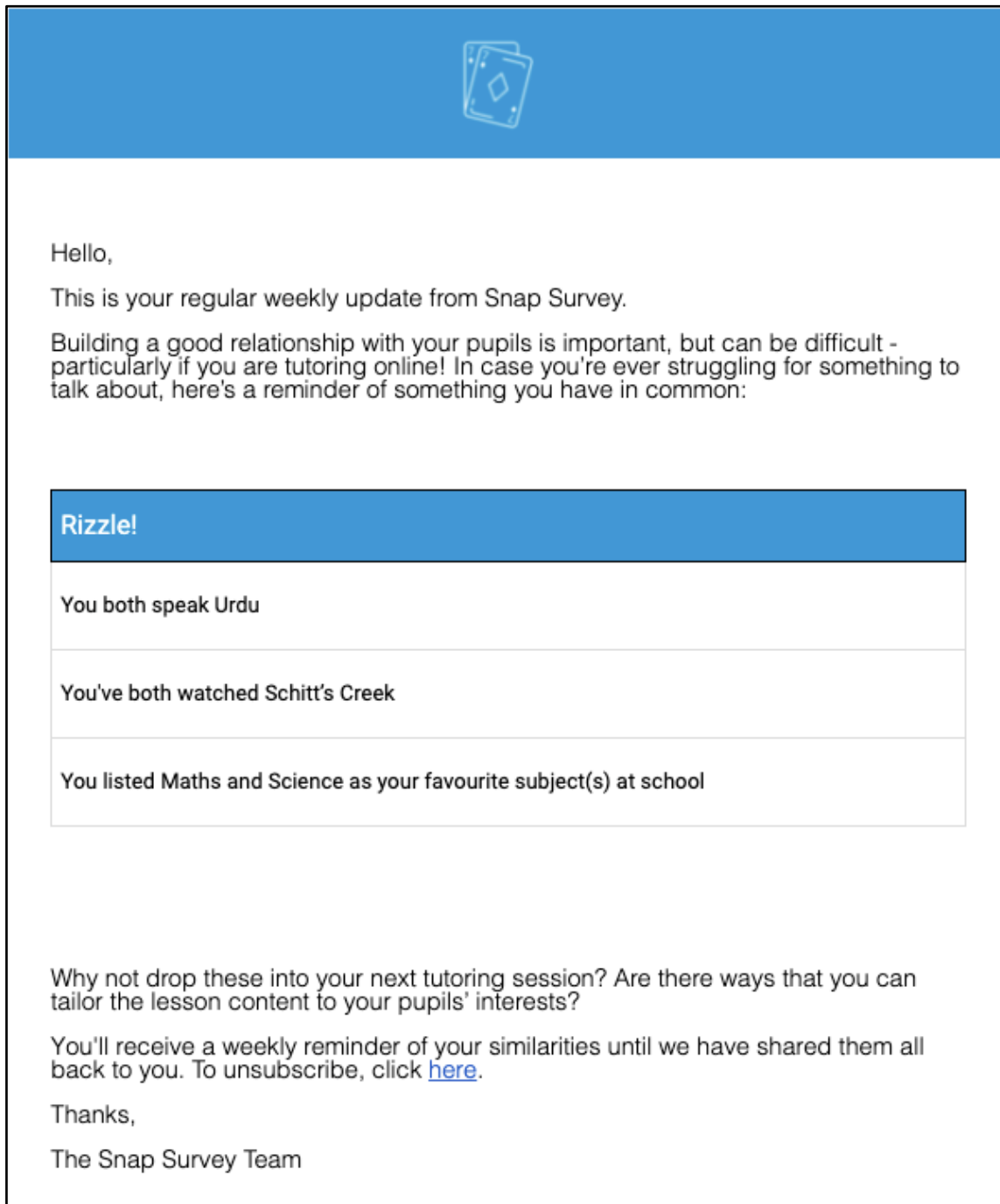


Figure 3: Example weekly reminder of similarities to tutor



For access to the full intervention, please visit [snapsurvey.org](https://snapsurvey.org) or email the project team (contact details on p.3 of this report).

## Appendix B: Ethical review

All BIT trials need to have been through BIT's internal research ethics process. This trial was assessed as being Low Risk.

On all dimensions barring two, the trial was determined to have minimal ethical risks. This was a light-touch intervention that was being delivered within an existing tutoring context, with minimal personal data collected on tutors and no personal data collected on pupils. Importantly, all of the tutors that oversaw the intervention were subject to screening and had undergone appropriate safeguarding training delivered by their Tuition Partner.

The first dimension in which the risk was identified as not Low is linked to the age and setting for the participants. Due to school closures, the majority of tutoring took place online in children's homes (rather than in their school as previously planned). The Tuition Partners in this trial underwent a rigorous process - overseen by the National Tutoring Programme - to ensure they were able to deliver tuition online to pupils in their homes safely. This included confirmation of parental consent and clear communication with parents and schools about safeguarding processes.

The second dimension in which the risk was identified as not Low relates to the nature of the data being collected. The survey was designed so as to prevent sharing any sensitive data. That is, all questions were multiple choice and were on non-controversial topics (e.g. favourite hobbies).

Personal, individual-level tutor data was collected for (a) all tutors that completed the online intervention, and (b) for tutors that agreed to participate in the IPE. On (a), tutors were informed that this personal, individual-level data would be collected in a Privacy Notice at the start of the activity. On (b), tutors provided their explicit consent to participate in the IPE. There was an ethical concern around confidentiality, particularly because of the power dynamic between tutors and tutor providers, their employers. All personal, individual-level data collected was treated with the strictest confidence by BIT, unless safeguarding or whistleblowing concerns were raised during the interview and required disclosure in line with any applicable laws and procedures on data protection and safeguarding that BIT must comply with. Reporting outputs contained anonymised quotes and case examples which could not be traced back to specific individuals. BIT has implemented appropriate measures to ensure secure storage and handling of Personal Data, including obtaining a Cyber Essentials Plus certification and developing a comprehensive Data Handling Protocol. We are registered with the UK ICO under the terms of the Data Protection Act 2018. We are confident that our processes ensured that the tutor's employer is not able to link our findings to a particular tutor.

The following table highlights in orange where the trial fell in terms of risk for different dimensions:

| Dimension        | Low risk                                                                                | Medium risk                                                                                                                                   | High risk                                                                                                        |
|------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Research methods | Standard research methods commonly applied within the substantive area of the research. | Standard research methods that may not have been applied within a particular substance area and that may prove controversial or be sensitive. | Non-standard research methods that may be highly controversial or sensitive.                                     |
| Participants     | Non-vulnerable adults (i.e. 18 years+ in England & Wales or as stated in                | Children without vulnerable characteristics in a regular setting (school/youth club).                                                         | Individuals from vulnerable groups (e.g. refugees) or are children outside regular settings or do not have legal |

|                  |                                                                                                                                                                                              |                                                                                                               |                                                                                                                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | applicable national legislation).                                                                                                                                                            |                                                                                                               | capacity within the meaning of the Mental Capacity Act 2005 or relevant national legislation. (NB: any research with the latter group requires approval via an additional legally mandated process.) |
| Subject matter   | Research relates to a politically and socially uncontroversial area, such as recycling.                                                                                                      | Research relates to an issue of some contention but is relatively light-touch                                 | Research relates to a highly-contentious, potentially currently debated or partisan issue                                                                                                            |
| Nature of data   | Aggregate anonymous data or data on non-contentious topics (e.g. recycling behaviour) or routinely collected admin data.                                                                     | Individual-level data not routinely collected.                                                                | Individual-level, highly sensitive or special category data routinely or not routinely collected. Also, criminal offence data                                                                        |
| Legal exposure   | The legal framework in which we are operating is clear. If the project is in a foreign country: we have worked in this country and a similar context before and know the legal requirements. | The legal situation with respect to any aspect (data collection, participant group, intervention) is unclear. | The legal situation with respect to any aspect (data collection, participant group, intervention) is controversial or problematic.                                                                   |
| Unknown unknowns | BIT has run a similar project in this domain before                                                                                                                                          | BIT has some experience in the domain, but certain aspects of the project are new to BIT.                     | BIT has no prior experience in this policy domain.                                                                                                                                                   |

This trial did not alert participants to the fact that they are taking part in a trial. All participating tutors agreed to an initial Privacy Notice covering the NTP that referenced their possible involvement in Reach & Engagement RCTs.

Before launching the trial, BIT registered it at the Open Science Framework (osf.io). BIT ensured the trial registry was updated with outcomes at the end of the project.

## Appendix C: Data protection

Throughout the project, BIT sought to minimise the collection of personal data. BIT performed the randomisation of tutors using BIT-ID numbers rather than names, and shared the randomisation results (including randomisation batch number) with tutoring providers; tutoring providers shared the intervention with the intervention tutors, so that BIT did not need contact details for this purpose. BIT also ensured that no personal data was visible to BIT team members during the video calls with tutoring providers to support the correct implementation of the randomisation.

BIT did need to collect personal data from the tutors who completed the intervention, and a privacy notice was hosted on the intervention website through which this personal data was collected. BIT collected the following information associated with these individual tutors:

- Tutor email addresses (so that BIT could administer the subsequent intervention reminders, and so that BIT could recruit and schedule TP staff case study interviews)
- Tutor names (so that the intervention reminders and interview recruitment correspondence could be personalised)
- Intervention question answers (which were used in the intervention reminders)
- Intervention delivery metadata (including date of completion)

These data allowed us to administer the intervention reminders and schedule and conduct interviews with tutors (as indicated above), as well as helping us answer RQ1 of the IPE, and helping us identify when the intervention was administered. BIT also collected personal data (name and email address) from those tutoring staff who took part in IPE interviews.

BIT told tutors to ensure that pupils entered codenames, rather than real names, when they completed the intervention. Therefore, BIT had access to pupil answers to the intervention's multiple choice questions (which were used in the reminders for the intervention tutors), and metadata about intervention delivery (including the date of completion, which helped us identify when the intervention was administered), but this was not personal data as BIT was not able to link it to individuals.

BIT collected data for the impact analysis from NFER against pupil IDs and tutor IDs rather than names. Ahead of this data transfer, tutoring providers shared with NFER each tutor's BIT-ID, their BIT trial randomisation assignment and their randomisation batch number, linked to tutor names and other data, as part of a scheduled NTP data transfer. NFER integrated these data into their relational database, and shared with BIT the data needed for our impact analysis, against newly-generated tutor and pupil ID numbers rather than names. Both the pupil and tutor tables contained the tutor's ID number, BIT trial randomisation assignment and randomisation batch number.

BIT performed a risk assessment analysis and concluded that these data are not considered to be personal. Nevertheless, BIT included a sentence in our privacy notice for intervention tutors (hosted on our intervention website) detailing the data collected from NFER, letting them know it was in anonymised form and that BIT were not linking it with the personal data collected from them.

## Additional data protection information

### 1. Legal bases for data processing

**LEGITIMATE INTERESTS:** Our lawful basis for processing personal data was legitimate interests (as per Article 6 (1) (f) of the GDPR) and BIT considered that participants' interests and fundamental rights did not override those legitimate interests.

It was necessary in BIT's 'legitimate interests' to process the personal data identified above in order to deliver a meaningful RCT that had been commissioned by EEF (commercial interests). The research project fulfilled BIT's core business aims including undertaking research, evaluation and information activities in sectors that will deliver social impact. This project has broader societal benefits; it tested the effectiveness of interventions designed to increase pupils' engagement with the National Tutoring Programme - an initiative designed to help address the

adverse consequences of COVID-19-related school closures for children's education, especially disadvantaged children.

## **2. Our approach to GDPR compliance**

BIT minimised the collection of personal data wherever possible in this project. BIT collected data for the impact evaluation against pupil and tutor IDs rather than names. BIT performed a risk assessment analysis and concluded that BIT did not consider these data to be personal.

BIT told tutors to ensure pupils use codenames, rather than real names, on the intervention website. BIT did, however, need to collect personal data from the tutors who completed the intervention (for the purposes of: administering the intervention reminders; recruiting and scheduling TP staff case study interviews; helping us answer RQ1 of the IPE; and allowing us to see when the intervention was administered, as described above). A privacy notice was hosted on the intervention website through which this personal data is collected, which explained what personal data BIT collected and why, our legal basis for doing so, who had access to the data, our data security arrangements and our plans for data retention. BIT appointed a Data Protection Officer (DPO) who was responsible for overseeing questions in relation to this privacy notice. The privacy notice contained the DPO's contact details, and informed the reader of their legal rights, including the right to make a complaint at any time to the Information Commissioner's Office (ICO), the UK supervisory authority for data protection issues ([www.ico.org.uk](http://www.ico.org.uk)). The privacy policy asked these tutors to make sure the details they provide are accurate and up to date, and to let us know about any changes as soon as possible.

As stated above, all personal data collected as part of the study was treated with the strictest confidence by BIT and processed only in accordance with the requirements of the GDPR and the Data Protection Act 2018. BIT did not use any personal data in any report arising from this project. BIT was collecting and processing personal data solely for the purposes of proper delivery, management and evaluation of the project.

### **2.1. Data security**

BIT took reasonable steps to protect personal information and followed procedures designed to minimise unauthorised access, alteration, loss or disclosure of personal information.

Taking into account the state of the art, the costs of implementation and the nature, scope, context and purposes of processing as well as the risk of varying likelihood and severity for the rights and freedoms of natural persons, BIT implemented appropriate technical and organisational measures to ensure a level of security appropriate to the risk of processing.

BIT ensured that those who had permanent or regular access to personal data, or were involved in the processing of personal data, were trained and informed of their rights and responsibilities when processing personal data. BIT provided such access on a need-to-know basis, and had measures in place which were designed to remove that access once it was no longer required.

Physical personal devices used by BIT were encrypted to protect personal data.

BIT put in place procedures to deal with any suspected personal data breach and notified participants and any applicable regulator of a breach where BIT were legally required to do so.

### **2.2. All parties with access to the data**

The personal data that BIT collects was accessed by a limited number of researchers and advisors in BIT's team working on this project.

BIT may disclose information to third parties in connection with the purposes of processing personal data set out in the privacy notices. These third parties may include:

- other companies in BIT's group [that are based within the United Kingdom];

- regulators, law enforcement bodies and the courts, in order to comply with applicable laws and regulations, assist with regulatory enquiries, and cooperate with court mandated processes, including the conduct of litigation;
- suppliers, research assistants and sub-contractors who may process information on behalf of BIT. These third parties are known as data processors and when BIT use them there are contractual terms and policies and procedures in place to ensure that personal data is protected. This does not always mean that they will have access to information that will directly identify individuals as BIT will share anonymised or pseudonymised data only wherever possible. BIT remain responsible for personal information as the controller; and
- any third party to whom BIT are proposing to sell or transfer some or all of our business or assets.

BIT may also disclose personal information if required by law, or to protect or defend ourselves or others against illegal or harmful activities, or as part of a reorganisation or restructuring of our organisations.

### **2.3. Data retention**

BIT did not retain any personal data longer than it is needed to deliver, manage and evaluate the project. The anticipated date of deletion of personal data was October 2021.

### **3. Data processing roles**

For the personal data collected (about intervention tutors via the intervention website): Behavioural Insights Ltd (the legal name of Behavioural Insights Team (BIT)) was the controller and was responsible for the personal data.

As noted in the section above, BIT may share personal data with a limited number of trusted data processors solely for the purposes of supporting the delivery, management and evaluation of the project. This will be detailed in the privacy notice on our intervention website.

It was not necessary to archive any personal data from this project.

## Appendix D: Project team

| Project team member   | Project role                                        |
|-----------------------|-----------------------------------------------------|
| Dr Giulia Tagliaferri | Principal Investigator                              |
| Dr Matthew Holt       | Qualitative Lead (IPE design and analysis)          |
| Lal Chadeesingh       | Project Manager and Intervention Design Lead        |
| Dr Alex Sutherland    | Senior Quality Assurance and Report Reviewer        |
| Nancy Wilkinson       | Quality Assurance and Senior Project Advisor        |
| Dr Raj Chande         | Quality Assurance and Senior Project Advisor        |
| Dr Kathryn Atherton   | Policy Advisor (Education) and Data Management Lead |
| Dave Wilson           | Policy Advisor (Education)                          |
| Rizwaan Malik         | Policy Advisor (Education)                          |
| Dr Yihan Xu           | Research and Analysis Supervisor                    |
| Dr Jo Milward         | Research and Analysis Advisor                       |
| Pujen Shrestha        | Research and Analysis Advisor                       |
| Stefan Kelly          | Research and Analysis Advisor                       |
| Dr Paul Calcraft      | Technical Lead (Intervention Website)               |

|                                               |                                        |
|-----------------------------------------------|----------------------------------------|
| Miranda Jackman                               | Product Manager (Intervention Website) |
| Eleanor Collerton                             | Project Advisor and Data Support       |
| Dr Todd Rogers (Harvard Kennedy School)       | Academic Advisor                       |
| Dr Carly Robinson (Brown University)          | Academic Advisor                       |
| Dr Hunter Gehlbach (Johns Hopkins University) | Academic Advisor                       |

## Appendix E: Impact analysis technical detail

### Analytical approaches

Analysis was Intention to Treat (ITT), meaning outcomes were analysed on the basis of the groups that tutors and pupils that were randomly allocated to regardless of implementation.

The covariates used in the analysis model included the stratifiers and a few variables that could influence the outcomes substantially, as listed in Table 4 in the main report. This increased the precision of our estimates. In particular, controlling for the batch (as part of the interaction batch \* tutoring provider) helped control for differences in the outcome variable that we might expect to be introduced by different start dates throughout the year. The interaction batch\*tutoring provider was effectively our strata.

The analysis used the raw form of the outcome data (i.e. percentage, not transformed or scaled, ranging from 0 to 100). We create the outcome variable using the following variables/formula:

attendance rate for pupil  $i$  =  $100 * (\# \text{ face-to-face sessions attended by pupil } i + \# \text{ online sessions attended by pupil } i) / (\# \text{ face-to-face sessions purchased by the school for pupil } i + \# \text{ online sessions purchased by the school for pupil } i)$

In the original data BIT received from NFER there were large occurrences of “BLANK” values across all variables used to construct this trial's outcome variables. After a review from NFER, BIT received an updated dataset where the primary provider of concern had resolved their “BLANK”s issue. Therefore BIT interpreted these “BLANK” as 15 (mode for sessions bought) if both online sessions bought and face-to-face session bought are “BLANK” ( $n = 38$ ) and a pupil has attended sessions. BIT interpreted “BLANK”s as 0 in online sessions attended or face-to-face sessions attended when a pupil has attended sessions (there were  $n = 0$  occurrences online sessions attended and face-to-face sessions attended were “BLANK”). This covers all possible permutations of “BLANK”s.

### Primary analysis

We evaluated the effect of the intervention on attendance using the following OLS regression model:

$$Y_i = \alpha + \beta_T \text{Treatment}_i + \beta_C \text{Covariates}_i + \eta \cdot \text{Stratifier}_i + \epsilon_i; \epsilon_i \sim N(0, \sigma^2)$$

- $Y_i$  is the outcome of interest (attendance rate [percentage]) for each pupil  $i$ .
- $\text{Treatment}_i$  is a dummy variable indicating which group participants were assigned to (0 = Control group, 1 = Treatment 1 group).
- $\text{Stratifier}_i$  is a fixed-effects variable that refers to the tutoring partner interacted by the randomisation batch number.
- $\text{Covariates}_i$  is a set of all covariates of interest as described in Table 4 of the main report.
- $\epsilon_i$  is the individual error term, clustered at the tutor level.

Following the trial protocol, all planned covariates in the trial protocol were checked for missing data pre-analysis, and those with missingness greater than 5% were removed from the model. This applied to PP status (7.9%) and SEND status (12%).

Table E1 provides the full results for the primary analysis (col. (1) and secondary analysis (col. (2)). The secondary analysis uses the same model and outcome as the primary analysis, but it restricts the sample to PP pupils.

We report impact estimates as effect sizes as  $\hat{\beta}_T$  with CI in the main text. For comparability between EEF projects and with the wider literature, we also report standardised effect sizes calculations using Hedges'  $g$  (1981). Hedges'  $g$  is used by both the What Works Clearinghouse and Campbell Collaboration, hence it is a suitable choice for these comparisons. Hedge's  $g$  is a weighted average of the variance of both groups, not the estimate of the variance of all individuals pooled (see Coe, 2002). Following the EEF's Statistical Guidance, Hedge's  $g$  was calculated by:

$$ES = \frac{M_1 - M_2}{SD_{pooled}^*}$$

Where,

- $M_1$  is the mean value of the outcome in the control group
- $M_2$  is the mean value of the outcome in the treatment group
- $SD_{pooled}^* = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$

Where,  $s_1^2$  is the variance of group 1; and equally defined for the control group  $n_2$ .  $n_1$  is the number of individuals in group 1; and equally defined for the control group. The difference in means for each outcome variable will be recovered from the relevant regression equation above ( $\hat{\beta}_T$ ). Ninety-five per cent confidence intervals (95% CIs) of the effect size will be estimated by inputting the upper and lower confidence limits from the regression model into the effect size formula.

The main analyst at BIT was not blinded to group allocation when doing the analysis (they knew which arm each tutor in the dataset was allocated to). However, a second independent analyst re-analysed the trial under blind allocation of treatment groups to quality assure results.

## Secondary analysis — Pupil Premium subgroup analysis

Secondary outcome analysis followed the same model specification used for the primary outcome except that only pupils eligible for Pupil Premium were included. **Table E1** provides the full results for the primary analysis (col. (1) and secondary analysis (col. (2))

## Exploratory analysis — Tutoring Provider analysis

Tutoring provider exploratory analysis followed the same model specification used for the primary outcome with the exception of the covariate of Tutoring Provider (which was used to create the subgroups for analysis) while also re-coding tutoring experience into *Less than 1 year*, *More than 1 year* and *other*. **Table E2** provides the full results for the Tutoring provider exploratory analysis.

## Exploratory analysis — Tutoring Experience analysis

Tutoring experience exploratory analysis followed the same model specification used for the primary outcome with the exception of the covariate of Tutoring Experience (which was used to create the subgroups for analysis). **Table E3** provides the full results for the Tutoring Experience exploratory analysis.

Table E1: Primary and secondary analysis, OLS regression coefficients (standard errors in parentheses)

|                                                     | (1)<br>Overall proportion of hours of tutoring attended | (2)<br>Proportion of hours of tutoring attended for PP Students |
|-----------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------|
| <b>Treatment</b><br>(reference category is Control) | 0.042***<br>(0.013)                                     | 0.026*<br>(0.015)                                               |
| <b>School year</b>                                  |                                                         |                                                                 |

|                                                                    |                     |                     |
|--------------------------------------------------------------------|---------------------|---------------------|
| (reference category is Year 10)                                    |                     |                     |
| Year 1                                                             | 0.306***<br>(0.056) | 0.265***<br>(0.076) |
| Year 2                                                             | 0.316***<br>(0.038) | 0.323***<br>(0.044) |
| Year 3                                                             | 0.263***<br>(0.034) | 0.260***<br>(0.041) |
| Year 4                                                             | 0.264***<br>(0.032) | 0.246***<br>(0.038) |
| Year 5                                                             | 0.279***<br>(0.022) | 0.280***<br>(0.023) |
| Year 6                                                             | 0.316***<br>(0.028) | 0.326***<br>(0.027) |
| Year 7                                                             | 0.066***<br>(0.019) | 0.017<br>(0.024)    |
| Year 8                                                             | 0.066***<br>(0.020) | 0.055**<br>(0.022)  |
| Year 9                                                             | 0.047**<br>(0.020)  | 0.057***<br>(0.021) |
| Year 11                                                            | 0.031<br>(0.023)    | 0.034<br>(0.027)    |
| <b>Main subject of tutoring</b><br>(reference category is English) |                     |                     |
| Maths                                                              | 0.012<br>(0.013)    | 0.001<br>(0.016)    |
| Science                                                            | 0.037<br>(0.026)    | 0.037<br>(0.030)    |
| MFL                                                                | -0.002<br>(0.034)   | 0.055<br>(0.044)    |

|                                                                |                      |                     |
|----------------------------------------------------------------|----------------------|---------------------|
| Other                                                          | -0.043<br>(0.047)    | -0.046<br>(0.053)   |
| Missing                                                        | -0.106***<br>(0.033) |                     |
| <b>Gender of tutor</b><br>(reference category is female)       |                      |                     |
| Male                                                           | 0.013<br>(0.017)     | 0.020<br>(0.019)    |
| Prefer not to say                                              | -0.033<br>(0.030)    | -0.048<br>(0.034)   |
| Missing                                                        | 0.238***<br>(0.039)  | 0.265***<br>(0.044) |
| <b>Tutor Experience</b><br>(reference category is 1 - 2 Years) |                      |                     |
| Tutor_experienceNo previous tutoring experience                | 0.048**<br>(0.022)   | 0.040<br>(0.026)    |
| Tutor_experienceLess than 12 months                            | 0.096**<br>(0.043)   | 0.159***<br>(0.056) |
| Tutor_experienceLess than 12 months                            | 0.096**<br>(0.043)   | 0.159***<br>(0.056) |
| Tutor_experience3 - 4 Years                                    | 0.038<br>(0.027)     | 0.050<br>(0.034)    |
| Tutor_experience5 - 10 Years                                   | 0.042<br>(0.034)     | 0.083*<br>(0.044)   |
| Tutor_experience11 - 15 Years                                  | 0.098**<br>(0.038)   | 0.124**<br>(0.048)  |

|                                    |                            |                    |
|------------------------------------|----------------------------|--------------------|
| Tutor_experience16 - 20 Years      | 0.125***<br>(0.047)        | 0.114**<br>(0.055) |
| Tutor_experience21 - 25 Years      | 0.075<br>(0.046)           | 0.038<br>(0.053)   |
| Tutor_experience26 - 30 Years      | 0.069<br>(0.049)           | 0.096<br>(0.068)   |
| Tutor_experience31 - 35 Years      | 0.053<br>(0.071)           | 0.077<br>(0.070)   |
| Tutor_experience36 - 40 Years      | -0.040<br>(0.093)          | 0.006<br>(0.118)   |
| Tutor_experienceMore than 40 Years | 0.0005<br>(0.133)          | -0.121*<br>(0.071) |
| Tutor_experienceOther              | 0.069***<br>(0.026)        | 0.044<br>(0.032)   |
| Tutor_experienceMissing            | -0.017<br>(0.081)          | -0.088<br>(0.111)  |
| Batch of randomisation*            |                            |                    |
| Tutoring Provider fixed effects    | Yes                        | Yes                |
| Observations                       | 8,922                      | 4,040              |
| R2                                 | 0.220                      | 0.220              |
| Notes:                             | *p<0.1; **p<0.05; ***p<0.0 |                    |

Table E2: Tutoring provider exploratory analysis, OLS regression coefficients (standard errors in parentheses)

|                                                     | (1) Tutor Trust     | (2) Tute         | (3) Manning      | (4) SPT            |
|-----------------------------------------------------|---------------------|------------------|------------------|--------------------|
| <b>Treatment</b><br>(reference category is Control) | 0.054***<br>(0.018) | 0.001<br>(0.025) | 0.012<br>(0.023) | 0.072**<br>(0.031) |

| Year group<br>(reference category is Year Group 10) |          |          |          |          |
|-----------------------------------------------------|----------|----------|----------|----------|
| Year Group 1                                        |          | 0.595*** |          | 0.147**  |
|                                                     |          | (0.050)  |          | (0.069)  |
| Year Group 2                                        |          | 0.526*** |          | 0.184*** |
|                                                     |          | (0.036)  |          | (0.057)  |
| Year Group 3                                        |          | 0.313*** |          | 0.150*** |
|                                                     |          | (0.057)  |          | (0.052)  |
| Year Group 4                                        |          | 0.383*** | 0.529*** | 0.119**  |
|                                                     |          | (0.043)  | (0.102)  | (0.054)  |
| Year Group 5                                        | 0.309*** | 0.307*** |          | 0.161*** |
|                                                     | (0.024)  | (0.037)  |          | (0.051)  |
| Year Group 6                                        | 0.312*** | 0.340*** | 0.529*** | 0.199*** |
|                                                     | (0.026)  | (0.055)  | (0.102)  | (0.056)  |
| Year Group 7                                        | 0.051**  | 0.137*** | 0.075**  | -0.094   |
|                                                     | (0.022)  | (0.039)  | (0.034)  | (0.060)  |
| Year Group 8                                        | 0.028    | 0.051    | 0.081**  | 0.026    |
|                                                     | (0.025)  | (0.074)  | (0.036)  | (0.062)  |
| Year Group 9                                        | 0.046*   | 0.040    | 0.027    | 0.050    |
|                                                     | (0.026)  | (0.069)  | (0.029)  | (0.066)  |
| Year Group 11                                       | -0.0001  | 0.021    | 0.063*   | -0.084   |
|                                                     | (0.044)  | (0.038)  | (0.036)  | (0.072)  |
| Year Group Missing                                  | 0.218    |          | -0.006   |          |
|                                                     | (0.193)  |          | (0.031)  |          |
| Main subject<br>(reference category: English)       |          |          |          |          |

|                                                                                          |                     |                     |                      |                   |
|------------------------------------------------------------------------------------------|---------------------|---------------------|----------------------|-------------------|
| Main subject Maths                                                                       | 0.013<br>(0.019)    | 0.056**<br>(0.024)  | -0.025<br>(0.027)    | -0.004<br>(0.024) |
| Main subject Science                                                                     | 0.086*<br>(0.049)   | 0.157***<br>(0.042) | -0.012<br>(0.035)    |                   |
| Main subject MFL                                                                         |                     | 0.011<br>(0.056)    | -0.007<br>(0.043)    |                   |
| Main subject Other                                                                       |                     | 0.113*<br>(0.063)   | -0.100*<br>(0.061)   | -0.050<br>(0.108) |
| Main subject MISSING                                                                     | -0.356*<br>(0.197)  |                     |                      |                   |
| <b>Tutor gender</b><br>(reference category is F)                                         |                     |                     |                      |                   |
| Tutor gender M                                                                           | 0.008<br>(0.021)    | -0.008<br>(0.027)   | 0.019<br>(0.028)     | -0.036<br>(0.068) |
| Tutor gender Prefer not to say                                                           | -0.024<br>(0.040)   |                     | -0.305***<br>(0.080) | -0.005<br>(0.037) |
| Tutor gender MISSING                                                                     | 0.199***<br>(0.062) |                     |                      |                   |
| <b>Tutoring experience</b><br>(reference category: Tutoring experience Less than a year) |                     |                     |                      |                   |
| Tutoring experience More than a year                                                     | -0.021              | -0.004              | -0.004               | -0.224***         |

|                                                             |                             |           |          |           |
|-------------------------------------------------------------|-----------------------------|-----------|----------|-----------|
|                                                             | (0.021)                     | (0.044)   | (0.036)  | (0.065)   |
| Tutoring experience                                         |                             |           |          |           |
| Other                                                       | 0.024                       | -0.010    |          | -0.281**  |
|                                                             | (0.027)                     | (0.049)   |          | (0.116)   |
| <b>Batch number</b><br>(reference category: Batch number 1) |                             |           |          |           |
| batch number 2                                              | 0.013                       | 0.038     | -0.016   | -0.108    |
|                                                             | (0.034)                     | (0.040)   | (0.097)  | (0.130)   |
| batch number 3                                              | -0.071**                    | 0.032     | -0.039   | 0.175***  |
|                                                             | (0.035)                     | (0.032)   | (0.075)  | (0.043)   |
| batch number 4                                              | 0.070*                      | -0.047    | 0.062    | -0.028    |
|                                                             | (0.041)                     | (0.049)   | (0.040)  | (0.076)   |
| batch number 5                                              | 0.010                       |           | 0.126**  | -0.154*** |
|                                                             | (0.037)                     |           | (0.049)  | (0.057)   |
| batch number 6                                              | -0.144**                    | -0.003    |          | -0.093    |
|                                                             | (0.057)                     | (0.033)   |          | (0.084)   |
| batch number 7                                              | 0.095***                    | 0.002     |          | -0.110    |
|                                                             | (0.022)                     | (0.034)   |          | (0.067)   |
| batch number 8                                              | 0.013                       | -0.197*** |          | -0.263*** |
|                                                             | (0.039)                     | (0.071)   |          | (0.032)   |
| Constant                                                    | 0.534***                    | 0.309***  | 0.497*** | 0.785***  |
|                                                             | (0.028)                     | (0.049)   | (0.043)  | (0.085)   |
| Observations                                                | 2,277                       | 1,077     | 2,843    | 2,725     |
| R2                                                          | 0.235                       | 0.329     | 0.075    | 0.124     |
| Notes:                                                      | *p<0.1; **p<0.05; ***p<0.01 |           |          |           |

Table E3: Tutoring experience exploratory analysis, OLS regression coefficients (standard errors in parentheses)

|                  | (1) Less than 1 year | (2) 1 - 2 years | (3) 3 - 4 years | (4) 5 - 10 years | (5) More than 10 years | (6) Other |
|------------------|----------------------|-----------------|-----------------|------------------|------------------------|-----------|
| <b>Treatment</b> | 0.050**              | 0.035           | 0.062           | 0.055            | 0.052*                 | -0.012    |

|                                                            |                     |                     |                     |                     |                     |                     |
|------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| (reference category is Control)                            | (0.023)             | (0.023)             | (0.046)             | (0.050)             | (0.032)             | (0.032)             |
| <b>Year group</b><br>(reference category is Year Group 10) |                     |                     |                     |                     |                     |                     |
| Year Group 1                                               | 0.408***<br>(0.058) | 0.384***<br>(0.044) | -0.073<br>(0.185)   | 0.402***<br>(0.088) | 0.298***<br>(0.079) | 0.474***<br>(0.103) |
| Year Group 2                                               | 0.441***<br>(0.081) | -0.013<br>(0.182)   | 0.066<br>(0.092)    | 0.307***<br>(0.086) | 0.340***<br>(0.063) | 0.634***<br>(0.125) |
| Year Group 3                                               | 0.144<br>(0.225)    | 0.328**<br>(0.131)  | 0.271***<br>(0.097) | 0.284***<br>(0.080) | 0.240***<br>(0.061) | 0.339*<br>(0.183)   |
| Year Group 4                                               | 0.210***<br>(0.032) | 0.397***<br>(0.048) | -0.033<br>(0.192)   | 0.256***<br>(0.069) | 0.253***<br>(0.063) | 0.112***<br>(0.032) |
| Year Group 5                                               | 0.339***<br>(0.029) | 0.291***<br>(0.041) | 0.220***<br>(0.055) | 0.242***<br>(0.066) | 0.241***<br>(0.058) | 0.315***<br>(0.046) |
| Year Group 6                                               | 0.347***<br>(0.031) | 0.282***<br>(0.064) | 0.110<br>(0.093)    | 0.254**<br>(0.108)  | 0.330***<br>(0.060) | 0.194***<br>(0.066) |
| Year Group 7                                               | 0.081***<br>(0.029) | 0.061*<br>(0.034)   | 0.037<br>(0.065)    | 0.025<br>(0.071)    | 0.074<br>(0.059)    | 0.063<br>(0.072)    |
| Year Group 8                                               | 0.047<br>(0.032)    | 0.055<br>(0.034)    | 0.001<br>(0.121)    | 0.068<br>(0.061)    | 0.197***<br>(0.057) | 0.059<br>(0.050)    |
| Year Group 9                                               | 0.035<br>(0.038)    | 0.018<br>(0.027)    | 0.012<br>(0.090)    | 0.112**<br>(0.046)  | 0.189***<br>(0.057) | 0.039<br>(0.039)    |
| Year Group 11                                              | -0.023<br>(0.046)   | 0.054<br>(0.038)    | 0.010<br>(0.058)    | -0.019<br>(0.066)   | -0.101*<br>(0.054)  | 0.079<br>(0.075)    |
| Year Group Missing                                         | -0.022<br>(0.052)   | -0.008<br>(0.035)   | -0.069<br>(0.087)   |                     |                     | -0.073<br>(0.071)   |

|                                                      |         |           |          |           |         |          |
|------------------------------------------------------|---------|-----------|----------|-----------|---------|----------|
| <b>Main subject</b><br>(reference category: English) |         |           |          |           |         |          |
| Main subject Maths                                   | -0.007  | -0.010    | -0.018   | 0.039     | 0.030   | 0.093**  |
|                                                      | (0.024) | (0.026)   | (0.030)  | (0.037)   | (0.023) | (0.037)  |
| Main subject Science                                 | 0.005   | -0.004    | -0.043   | 0.035     | 0.078   | 0.214*** |
|                                                      | (0.035) | (0.040)   | (0.094)  | (0.113)   | (0.070) | (0.081)  |
| Main subject MFL                                     | -0.032  | -0.028    | 0.078    | -0.130    | 0.017   | -0.045   |
|                                                      | (0.058) | (0.048)   | (0.110)  | (0.132)   | (0.053) | (0.091)  |
| Main subject Other                                   | -0.067  | -0.088    | -0.158   | -0.233*** | 0.122   | -0.099   |
|                                                      | (0.119) | (0.067)   | (0.133)  | (0.075)   | (0.077) | (0.106)  |
| Main subject MISSING                                 |         | -0.114*** |          |           |         |          |
|                                                      |         | (0.043)   |          |           |         |          |
| <b>Tutor gender</b><br>(reference category is F)     |         |           |          |           |         |          |
| Tutor gender M                                       | 0.016   | 0.037     | -0.002   | 0.017     | -0.003  | -0.128** |
|                                                      | (0.025) | (0.029)   | (0.052)  | (0.050)   | (0.040) | (0.057)  |
| Tutor gender Prefer not to say                       | -0.046  | 0.145*    | -0.421** | -0.072    | -0.005  | -0.110   |
|                                                      | (0.054) | (0.075)   | (0.167)  | (0.047)   | (0.052) | (0.077)  |
| Tutor gender MISSING                                 |         |           |          |           |         | 0.081    |
|                                                      |         |           |          |           |         | (0.075)  |
| <b>TP</b> (reference category: Mannings)             |         |           |          |           |         |          |
| School Partnership Tutors                            | 0.067*  | -0.199*** | 0.011    |           |         |          |

|                                                                |          |           |          |          |           |           |
|----------------------------------------------------------------|----------|-----------|----------|----------|-----------|-----------|
|                                                                | (0.039)  | (0.041)   | (0.081)  |          |           |           |
| The Tutor Trust                                                | 0.048*   | 0.040     | 0.081    | 0.024    |           | 0.272**   |
|                                                                | (0.028)  | (0.028)   | (0.054)  | (0.074)  |           | (0.123)   |
| TUTE                                                           | 0.034    | -0.115    | -0.218   | 0.034    | -0.134*** | 0.061     |
|                                                                | (0.058)  | (0.078)   | (0.151)  | (0.059)  | (0.033)   | (0.129)   |
| <b>Batch number</b><br>(reference category:<br>Batch number 1) |          |           |          |          |           |           |
| batch number 2                                                 | -0.040   | 0.102**   | 0.152**  | -0.104   | 0.083*    | 0.058     |
|                                                                | (0.054)  | (0.049)   | (0.068)  | (0.074)  | (0.049)   | (0.054)   |
| batch number 3                                                 | 0.005    | -0.180*   | -0.023   | -0.123** | 0.112***  | 0.047     |
|                                                                | (0.049)  | (0.092)   | (0.165)  | (0.058)  | (0.042)   | (0.073)   |
| batch number 4                                                 | 0.090*** | -0.009    | -0.229   | -0.094   | 0.002     | -0.156*** |
|                                                                | (0.029)  | (0.040)   | (0.213)  | (0.110)  | (0.047)   | (0.044)   |
| batch number 5                                                 | 0.092**  | -0.151*** | 0.067    | -0.109** | -0.175*** |           |
|                                                                | (0.036)  | (0.034)   | (0.053)  | (0.050)  | (0.063)   |           |
| batch number 6                                                 | -0.102*  | -0.090    | -0.030   | -0.042   | 0.043     | -0.084*   |
|                                                                | (0.054)  | (0.081)   | (0.101)  | (0.064)  | (0.041)   | (0.047)   |
| batch number 7                                                 | 0.058    | 0.143***  | 0.041    |          | -0.055    | 0.048     |
|                                                                | (0.035)  | (0.045)   | (0.091)  |          | (0.096)   | (0.068)   |
| batch number 8                                                 | -0.050   | 0.083**   | 0.024    |          | -0.110    | -0.020    |
|                                                                | (0.162)  | (0.036)   | (0.050)  |          | (0.071)   | (0.066)   |
| Constant                                                       | 0.480*** | 0.476***  | 0.554*** | 0.434*** | 0.467***  | 0.283**   |
|                                                                | (0.034)  | (0.031)   | (0.065)  | (0.051)  | (0.063)   | (0.128)   |
| Observations                                                   | 1,647    | 2,855     | 620      | 890      | 2,249     | 661       |

|                                   |       |       |       |       |       |       |
|-----------------------------------|-------|-------|-------|-------|-------|-------|
| R2                                | 0.203 | 0.115 | 0.282 | 0.219 | 0.211 | 0.244 |
| Note: *p<0.1; **p<0.05; ***p<0.01 |       |       |       |       |       |       |

## Randomisation Summary

|                            | Batch         | Treatment (n) | Control (n) | Total (n) |
|----------------------------|---------------|---------------|-------------|-----------|
| Manning's Tutors           | 1st, 18th Feb | 143           | 143         | 284       |
| Schools Partnership Tutors | 1st, 18th Feb | 192           | 192         | 382       |
| Tute                       | 1st, 18th Feb | 17            | 17          | 32        |
| The Tutor Trust            | 1st, 18th Feb | 242           | 243         | 483       |
| Manning's Tutors           | 2nd, 4th Mar  | 5             | 6           | 9         |
| Schools Partnership Tutors | 2nd, 4th Mar  | 27            | 27          | 52        |
| Tute                       | 2nd, 4th Mar  | 3             | 3           | 4         |
| The Tutor Trust            | 2nd, 4th Mar  | 24            | 23          | 45        |
| Manning's Tutors           | 3rd, 18th Mar | 11            | 12          | 21        |
| Schools Partnership Tutors | 3rd, 18th Mar | 25            | 25          | 48        |
| Tute                       | 3rd, 18th Mar | 6             | 7           | 11        |
| The Tutor Trust            | 3rd, 18th Mar | 8             | 7           | 13        |
| Manning's Tutors           | 4th, 6th Apr  | 6             | 7           | 11        |
| Schools Partnership Tutors | 4th, 6th Apr  | 20            | 19          | 37        |
| Tute                       | 4th, 6th Apr  | 16            | 16          | 30        |
| The Tutor Trust            | 4th, 6th Apr  | 5             | 6           | 9         |
| Manning's Tutors           | 5th, 16th Apr | 6             | 7           | 11        |

|                            |               |    |    |    |
|----------------------------|---------------|----|----|----|
| Schools Partnership Tutors | 5th, 16th Apr | 9  | 9  | 16 |
| The Tutor Trust            | 5th, 16th Apr | 11 | 10 | 19 |
| Tute                       | 6th, 29th Apr | 15 | 16 | 29 |
| Schools Partnership Tutors | 6th, 29th Apr | 8  | 8  | 14 |
| The Tutor Trust            | 6th, 29th Apr | 12 | 12 | 22 |
| The Tutor Trust            | 7th, 13th May | 15 | 14 | 27 |
| Schools Partnership Tutors | 7th, 13th May | 8  | 7  | 13 |
| The Tute                   | 7th, 13th May | 3  | 4  | 5  |
| The Tutor Trust            | 7th, 28th May | 6  | 6  | 10 |
| Schools Partnership Tutors | 8th, 28th May | 10 | 9  | 17 |
| Tute                       | 8th, 28th May | 3  | 3  | 4  |

## Appendix F: IPE analysis technical detail

The overall mixed method approach was selected to complement the impact evaluation by providing context, depth and explanatory power. Where the impact evaluation focused on whether the intervention worked, the IPE methods were selected to understand why and how the intervention worked or did not work. More specifically, the semi-structured interview with providers allowed researchers to better understand project delivery in relation to programme aims and objectives, practicalities of delivery, technical capabilities and communication with schools and pupils. This provided rich context with which to assess implementation alongside the attendance data collected in the impact evaluation. Provider perspectives were further complemented by data collected from the survey platform which allowed for the exploration of intervention implementation.

The tutor interviews provided an important opportunity to capture the perspectives and experiences of tutors who took part in the intervention, or declined to take part, and more specifically, to isolate the mechanisms that were more and less motivating for them to complete the activity. The interviews also allowed researchers to better understand the experience of pupils, through tutors, and to collect insightful suggestions for improvement for future iterations of the intervention.

| Method                                     | Research questions                                                                                                                                                                         | Research topic                            | Detail                                                                                                                                                                                                                            |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delivery provider interviews               | 3.How did tutors and TP staff experience the intervention?<br><br>4.How was the intervention implemented?<br><br>5.What were the barriers and facilitators to implementation and delivery? | Quality<br><br>Fidelity<br><br>Mechanisms | Interview questions asked respondents to comment on whether the activity and reminders were delivered in the intended format, number and schedule. Questions also focused on perspectives of the intervention and its usefulness. |
| Tutor interviews with participating tutors | 3.How did tutors and TP staff experience the intervention?<br><br>4.How was the intervention implemented?<br><br>5.What were the barriers and facilitators to implementation and delivery? | Quality<br><br>Fidelity<br><br>Mechanisms | Interview questions focused on the appeal of the intervention, accessibility and reminders, the appropriateness and usefulness of the intervention, perceived outcomes for tutors and pupils and suggested improvements.          |

|                                        |                                                                                                                                                                                                         |                                                  |                                                                                                                                                    |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Tutor interviews with declining tutors | <p>3.How did tutors and TP staff experience the intervention?</p> <p>4.How was the intervention implemented?</p> <p>5.What were the barriers and facilitators to implementation and delivery?</p>       | <p>Quality</p> <p>Fidelity</p> <p>Mechanisms</p> | Interview questions focused on the appeal of the intervention, accessibility and reminders, the appropriateness and usefulness of the intervention |
| Survey/WebApp data                     | <p>1.What proportion of tutors in the treatment group started and completed the activity?</p> <p>2.How many tutors partially completed the activity?</p> <p>4.How was the intervention implemented?</p> | <p>Compliance</p> <p>Reach</p> <p>Fidelity</p>   | Data captured activity completion, partial completion and provider implementation.                                                                 |

A purposive sampling approach was used for both the delivery partner interview and the tutor interviews. It was intended that one staff member from each provider would take part in an interview, selected based on their role in delivering the project. Tutors were sampled based on their participation in the trial arms, as well as their experience of tutoring and number of tutees. Each provider was responsible for identifying the tutors based on the set criteria, mostly due to BIT's priority of minimising the processing of personal data and to leverage existing relationships of tutors with their providers.

Data were collected by the evaluation team at BIT. BIT researchers conducted interviews with TPs and tutors, and the feedback forms were developed with restricted access to responses. The project delivery team was involved in disseminating recruitment materials to their staff and disseminating the materials and feedback forms to pupils, using a sample frame provided by BIT. BIT researchers also extracted data from the survey platform.

For quantitative data, descriptive statistics were generated to determine proportions of completion. For qualitative data, a thematic analysis was conducted using Braun & Clarke's (2006) six-step approach to thematic analysis. Specifically, researchers undertook the following steps:

Step 1: Become familiar with the data; Step 2: Generate initial codes; Step 3: Search for themes; Step 4: Review themes; Step 5: Define themes; Step 6: Write-up.

A coding frame was constructed deductively based on the research questions and topics of exploration in the interview and feedback forms. BIT researchers coded the interview transcript and feedback form responses using the following codebook:

1. Quality
  - 1.1 Positives about activity
  - 1.2 Negatives about activity
  - 1.3 Perceived outcomes on tutor/pupil relationships
  - 1.4 Perceived outcomes on pupil attendance

- 1.5 Other perceived outcomes
- 1.6 Suggestions for improvement
- 2. Fidelity
  - 2.1 Evidence of fidelity
  - 2.2 Adaptations to delivery by TPs
  - 2.3 Rationale and outcomes for TP adaptation
  - 2.4 Adaptations to delivery by tutors
  - 2.5 Rationale and outcomes for tutor adaptation
- 3. Mechanisms
  - 3.1 Facilitators to activity uptake
  - 3.2 Barriers to activity uptake
  - 3.3 Facilitators to activity implementation
  - 3.4 Barriers to activity implementation
  - 3.5 Facilitators to pupil attendance
  - 3.6 Barriers to pupil attendance

Researchers then conducted a thematic analysis on the coded data, inductively identifying patterns within each code and labelling themes. Themes underwent a further round of classifying and were sorted into high-level themes and sub-themes.

## Appendix G: Randomisation and analysis code

Randomisation Code:

```
# National Tutoring Programme — RCT2 Prioritising tutor relationships
```

```
# Stratified Randomisation
```

```
# 0. Set up
```

```
## Load libraries
```

```
library(psych)
```

```
library(data.table)
```

```
library(dplyr)
```

```
library(TREX)
```

```
library(foreign)
```

```
library(xlsx)
```

```
## Decimal places
```

```
options(digits=4)
```

```
setBITPalette()
```

```
## Set working directory
```

```
currentwd = "G:\\My Drive\\CHEEKY\\YH Project data folder\\[Project data] POEE2 POEE3 National Tutoring Programme"
```

```
# Replace with your wd for replication
```

```
## For Mac
```

```
currentwd = "/Users/home/Desktop/national tutoring program/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Randomisation/"
```

```
setwd(currentwd)
```

```
# 1. Import dataset
```

```
## Batch 1 (Feb 18th, 2021)
```

```
### Manning's Tutors
```

```
data_filepath1 = "./T1-Input/batch1/List of BIT-IDs Batch 1 (Manning's).xlsx"
```

```
mannings = readxl::read_xlsx(data_filepath1, 1)
```

```
mannings$tutoringPartner <- "Manning's Tutors"
```

```
str(mannings)
```

```
### Schools Partnership Tutors
```

```
data_filepath2 = "./T1-Input/batch1/List of BIT IDs Batch 1 SPT.xlsx"
```

```
spt = readxl::read_xlsx(data_filepath2, 1)
```

```
spt$tutoringPartner <- "Schools Partnership Tutors"  
str(spt)
```

```
#### Tute  
data_filepath3 = "/T1-Input/batch2/List of BIT-IDs Batch 1 - Tute Education.xlsx"  
tute = readxl::read_xlsx(data_filepath3, 1)  
tute$tutoringPartner <- "Tute"  
str(tute)
```

```
#### The Tutor Trust  
data_filepath4 = "/T1-Input/batch2/List of BIT-IDs Batch 1 (The Tutor Trust).xlsx"  
tutorTrust = readxl::read_xlsx(data_filepath4, 1)  
tutorTrust$tutoringPartner <- "The Tutor Trust"  
str(tutorTrust)
```

```
## Batch 2 (Mar 4th, 2021)  
#### Manning's Tutors  
data_filepath5 = "/T1-Input/batch2/List of BIT-IDs Batch 2 (Manning_s Tutors).xlsx"  
mannings = readxl::read_xlsx(data_filepath5, 1)  
mannings$tutoringPartner <- "Manning's Tutors"  
str(mannings)
```

```
#### Schools Partnership Tutors  
data_filepath6 = "/T1-Input/batch2/List of BIT IDs Batch 2 SPT.xlsx"  
spt = readxl::read_xlsx(data_filepath6, 1)  
spt$tutoringPartner <- "Schools Partnership Tutors"  
str(spt)
```

```
#### Tute  
data_filepath7 = "/T1-Input/batch2/List of BIT-IDs Batch 2 - Tute Education.xlsx"  
tute = readxl::read_xlsx(data_filepath7, 1)  
tute$tutoringPartner <- "Tute"  
str(tute)
```

```
#### The Tutor Trust  
data_filepath8 = "/T1-Input/batch2/List of BIT IDs Batch 2 Tutor Trust.xlsx"  
tutorTrust = readxl::read_xlsx(data_filepath8, 1)  
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
## Batch 3 (Mar 17th, 2021)
```

```
### Manning's Tutors
```

```
data_filepath9 = "/T1-Input/batch3/BIT-ID Batch 3 (Manning's).xlsx"
```

```
mannings = readxl::read_xlsx(data_filepath9, 1)
```

```
mannings$tutoringPartner <- "Manning's Tutors"
```

```
str(mannings)
```

```
### Schools Partnership Tutors
```

```
data_filepath10 = "/T1-Input/batch3/List of BIT IDs Batch 3 SPT.xlsx"
```

```
spt = readxl::read_xlsx(data_filepath10, 1)
```

```
spt$tutoringPartner <- "Schools Partnership Tutors"
```

```
str(spt)
```

```
### Tute
```

```
data_filepath11 = "/T1-Input/batch3/List of BIT-IDs Batch 3 - Tute Education.xlsx"
```

```
tute = readxl::read_xlsx(data_filepath11, 1)
```

```
tute$tutoringPartner <- "Tute"
```

```
str(tute)
```

```
### The Tutor Trust
```

```
data_filepath12 = "/T1-Input/batch3/Tutor Trust BIT IDs Batch 3.xlsx"
```

```
tutorTrust = readxl::read_xlsx(data_filepath12, 1)
```

```
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
## Batch 4 (Apr 6th, 2021)
```

```
### Manning's Tutors
```

```
data_filepath13 = "/T1-Input/batch4/List of BIT-IDs Batch 4 (Manning's).xlsx"
```

```
mannings = readxl::read_xlsx(data_filepath13, 1)
```

```
mannings$tutoringPartner <- "Manning's Tutors"
```

```
str(mannings)
```

```
### Schools Partnership Tutors
```

```
data_filepath14 = "/T1-Input/batch4/List of BIT IDs Batch 4 SPT.xlsx"
```

```
spt = readxl::read_xlsx(data_filepath14, 1)
```

```
spt$tutoringPartner <- "Schools Partnership Tutors"
```

```
str(spt)
```

```
#### Tute
```

```
data_filepath15 = "/T1-Input/batch4/List of BIT-IDs Batch 4 - Tute Education.xlsx"
```

```
tute = readxl::read_xlsx(data_filepath15, 1)
```

```
tute$tutoringPartner <- "Tute"
```

```
str(tute)
```

```
#### The Tutor Trust
```

```
data_filepath16 = "/T1-Input/batch4/TT BIT IDs Batch 4.xlsx"
```

```
tutorTrust = readxl::read_xlsx(data_filepath16, 1)
```

```
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
## Batch 5 (Apr 16th, 2021)
```

```
#### Manning's Tutors
```

```
data_filepath17 = "/T1-Input/batch5/Mannings Batch 5 BIT IDs.xlsx"
```

```
mannings = readxl::read_xlsx(data_filepath17, 1)
```

```
mannings$tutoringPartner <- "Manning's Tutors"
```

```
str(mannings)
```

```
#### Schools Partnership Tutors
```

```
data_filepath18 = "/T1-Input/batch5/Batch 5 BIT IDs SPT.xlsx"
```

```
spt = readxl::read_xlsx(data_filepath18, 1)
```

```
spt$tutoringPartner <- "Schools Partnership Tutors"
```

```
str(spt)
```

```
# #### Tute
```

```
# data_filepath19 = "/T1-Input/batch5/List of BIT-IDs Batch 5 - Tute Education.xlsx"
```

```
# tute = readxl::read_xlsx(data_filepath19, 1)
```

```
# tute$tutoringPartner <- "Tute"
```

```
# str(tute)
```

```
#### The Tutor Trust
```

```
data_filepath20 = "/T1-Input/batch6/Tutor Trust Batch 5 BIT IDs.xlsx"
```

```
tutorTrust = readxl::read_xlsx(data_filepath20, 1)
```

```
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
## Batch 6 (Apr 29th, 2021)
### Manning's Tutors
# data_filepath21 = "/T1-Input/batch6/Mannings Batch 5 BIT IDs.xlsx"
# mannings = readxl::read_xlsx(data_filepath17, 1)
# mannings$tutoringPartner <- "Manning's Tutors"
# str(mannings)

### Schools Partnership Tutors
data_filepath22 = "/T1-Input/batch6/List of BIT IDs Batch 6 SPT.xlsx"
spt = readxl::read_xlsx(data_filepath22, 1)
spt$tutoringPartner <- "Schools Partnership Tutors"
str(spt)

# ### Tute
data_filepath23 = "/T1-Input/batch6/List of BIT-IDs Batch 6 - Tute Education.xlsx"
tute = readxl::read_xlsx(data_filepath23, 1)
tute$tutoringPartner <- "Tute"
str(tute)

### The Tutor Trust
data_filepath24 = "/T1-Input/batch6/TT BIT IDs Batch 6.xlsx"
tutorTrust = readxl::read_xlsx(data_filepath24, 1)
tutorTrust$tutoringPartner <- "The Tutor Trust"
str(tutorTrust)

## Batch 7 (May 13th, 2021)
### Schools Partnership Tutors
data_filepath25 = "/T1-Input/batch7/List of BIT IDs Batch7 SPT.xlsx"
spt = readxl::read_xlsx(data_filepath25, 1)
spt$tutoringPartner <- "Schools Partnership Tutors"
str(spt)

### Tute
data_filepath26 = "/T1-Input/batch7/List of BIT-IDs Batch 7 - Tute Education.xlsx"
tute = readxl::read_xlsx(data_filepath26, 1)
tute$tutoringPartner <- "Tute"
str(tute)
```

```
#### The Tutor Trust
```

```
data_filepath27 = "/T1-Input/batch7/TT Batch 7 BIT IDs no Names.xlsx"
```

```
tutorTrust = readxl::read_xlsx(data_filepath27, 1)
```

```
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
## Batch 8 (May 28th, 2021)
```

```
#### Schools Partnership Tutors
```

```
data_filepath28 = "/T1-Input/batch8/Tutors Batch 8 BIT ID_s [SPT].xlsx"
```

```
spt = readxl::read_xlsx(data_filepath28, 1)
```

```
spt$tutoringPartner <- "Schools Partnership Tutors"
```

```
str(spt)
```

```
#### Tute
```

```
data_filepath29 = "/T1-Input/batch8/List of BIT-IDs Batch 8 - Tute Education.xlsx"
```

```
tute = readxl::read_xlsx(data_filepath29, 1)
```

```
tute$tutoringPartner <- "Tute"
```

```
str(tute)
```

```
#### The Tutor Trust
```

```
data_filepath30 = "/T1-Input/batch8/BIT Batch 8 Anonymised [TTT].xlsx"
```

```
tutorTrust = readxl::read_xlsx(data_filepath30, 1)
```

```
tutorTrust$tutoringPartner <- "The Tutor Trust"
```

```
str(tutorTrust)
```

```
#### Merge data
```

```
# batch = rbind(mannings, spt, tute, tutorTrust)
```

```
batch = rbind(spt, tute, tutorTrust)
```

```
str(batch)
```

```
table(batch$tutoringPartner) # descriptive of each batch (2 of each sample is Riz & Dave)
```

```
## Batch 1 ID
```

```
# rizID = c("TT1000", "MT1000", "SPT1000", "TUTE1001") #Treatment
```

```
# daveID = c("TT1001", "MT1001", "SPT1001", "TUTE1002") #Control
```

```
## Batch 2 ID
```

```
# rizID = c("MT2000", "SPT2000", "TUTE2001", "TT2000") #Treatment
```

```
# daveID = c("MT2001", "SPT2001", "TUTE2002", "TT2001") #Control
```

```
## Batch 3 ID
```

```
# rizID = c("MT3000", "SPT3000", "TUTE3001", "TT3000") #Treatment
```

```
# daveID = c("MT3001", "SPT3001", "TUTE3002", "TT3001") #Control
```

```
## Batch 4 ID
```

```
# rizID = c("MT4000", "SPT4000", "TUTE4001", "TT4000") #Treatment
```

```
# daveID = c("MT4001", "SPT4001", "TUTE4002", "TT4001") #Control
```

```
## Batch 5 ID
```

```
# rizID = c("MT5000", "SPT5000", "TUTE5001", "TT5000") #Treatment
```

```
# daveID = c("MT5001", "SPT5001", "TUTE5002", "TT5001") #Control
```

```
## Batch 6 ID
```

```
# rizID = c("MT6000", "SPT6000", "TUTE6001", "TT6000") #Treatment
```

```
# daveID = c("MT6001", "SPT6001", "TUTE6002", "TT6001") #Control
```

```
## Batch 7 ID
```

```
# rizID = c("MT7000", "SPT7000", "TUTE7001", "TT7000") #Treatment
```

```
# daveID = c("MT7001", "SPT7001", "TUTE7002", "TT7001") #Control
```

```
## Batch 8 ID
```

```
rizID = c("MT8000", "SPT8000", "TUTE8001", "TT8000") #Treatment
```

```
daveID = c("MT8001", "SPT8001", "TUTE8002", "TT8001") #Control
```

```
# 2. Randomisation
```

```
## Set seed
```

```
# set.seed(20210218) # Randomisation for the first batch
```

```
# set.seed(20210304) # Randomisation for the second batch
```

```
# set.seed(20210318) # Randomisation for the third batch
```

```
# set.seed(20210406) # Randomisation for the fourth batch
```

```
# set.seed(20210416) # Randomisation for the fifth batch
```

```
# set.seed(20210429) # Randomisation for the sixth batch
```

```
# set.seed(20210513) # Randomisation for the seventh batch
```

```
set.seed(20210528) # Randomisation for the eighth batch
```

```
## Riz and Dave
```

```
riz = batch[(batch$BITID %in% rizID),]  
riz$treatment <- "Treatment"  
dave = batch[(batch$BITID %in% daveID),]  
dave$treatment <- "Control"  
  
## Filtering out Riz and Dave  
batch = batch[!(batch$BITID %in% rizID)&!(batch$BITID %in% daveID),] #Exclude dave & riz  
  
## Stratified randomisation by tutoring partner  
batch$treatment = stratifyRandomise(batch$tutoringPartner,n=2)  
batch$treatment = ifelse(batch$treatment == 1, "Treatment", "Control")  
  
## Combine the data set with Riz and Dave  
batch = rbind(riz, dave, batch)  
  
## Sort batch by tutoring partner  
batch = batch[order(batch$tutoringPartner),]  
  
## Summary  
gmodels::CrossTable(batch$tutoringPartner, batch$treatment) # Check balance by condition
```

Cleaning Code:

```
#### NTP RCT 1 - CLEANING code
```

```
# AUTHOR: Pujen Shrestha
```

```
# DATE: 24/11/2021
```

```
# PROJECT: National Tutoring Programme, RCT 1
```

```
# Report to-do's here: https://docs.google.com/document/d/1RyhjWM7OwCOCeZ-zfHjgJRLrqXLoSJpaW9sgE_kVMHY/edit#
```

```
# Set-up -----
```

```
#rm(list = ls()) #clear environment
```

```
#### Load packages w/ comment for use
```

```
library(tidyverse) # main data manipulation functions
```

```
library(data.table) # secondary data manipulation functions
```

```
library(TREX) # core BIT package
```

```
library("writexl") # read excel
```

```
# Set-up -----
```

```
library(lfe)
```

```
library(scales)
```

```
library(lemon)
```

```
library(lubridate)
```

```
library(readxl)
```

```
library(lme4)
```

```
library(Rmisc)
```

```
library(table1)
```

```
# Load data -----
```

```
# The data we have for this trial is spread across two datasets.
```

```
# Tutor data WITHOUT the duplicate indicator
```

```
# Tutors_datapath <- "/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T1-Input/BIT_Tutor File_shared.xlsx"
```

```
# Tutor data WITH the duplicate indicator
```

```
tutor_datpath <- "/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T1-Input/BIT_Duplicate Tutor File_shared.xlsx"
```

```
# Pupil data

#          pupil_datapath          <-          "/Volumes/GoogleDrive/.shortcut-targets-by-
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1
— Birds of a feather/Analysis/T1-Input/BIT_Pupil file_shared.xlsx"

## Updated data with corrected STP

pupil_datapath          <-          "/Volumes/GoogleDrive/.shortcut-targets-by-
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1
— Birds of a feather/Analysis/T1-Input/BIT_Pupil file_UPDATED_FINAL_C_shared_22122021_v2.xlsx"

# Read data -----

# Tutor data

tutor_data <- read_xlsx(tutor_dathpath)

# Hold raw version

tutor_data_raw <- tutor_data

# Pupil data

pupil_data <- read_xlsx(pupil_datapath)

# Hold raw version

pupil_data_raw <- pupil_data

# Check value types -----

str(pupil_data_raw)

# Rename columns -----

#### Tutor dataset recoding/renmaing

tutor_columns_raw <- length(names(tutor_data)) # using this and relevant lines to make sure I don't drop any
columns by mistake

# note that there are quicker ways to rename but because I also want to change the data type of some columns
and recode rct assignment I'm using dplyr::transmute to do it all in one go

tutor_data <- tutor_data %>%
  transmute(line_no = LineNo,
            tp_name = factor(`TP Name`),
            BIT_Tutor_ID = BIT_Tutor_ID,
```

```
batch_number = factor(`Batch Number`),  
rct_assignment = factor(case_when(`RCT Assignment` == "control" ~ "Control", # two of the tutors were  
missed coded as "control" and not "Control" this is unusual but we have just recoded them as 'Control'  
`RCT Assignment` == "Control" ~ "Control",  
`RCT Assignment` == "Treatment" ~ "Treatment")),  
Tutor_gender = factor(Tutor_gender),  
Tutor_experience = factor(Tutor_experience),  
Dup_Flag_BIT = factor(Dup_Flag_BIT),  
New_Dup_Tutor_id = New_Dup_Tutor_id)  
  
tutor_columns <- length(names(tutor_data))  
  
### length check - TRUE  
tutor_columns_raw == tutor_columns  
  
### Pupil dataset rename  
### Tutor renaming  
pupil_columns_raw <- length(names(pupil_data))  
  
pupil_data <- pupil_data %>%  
  transmute(BIT_Tutor_ID = BIT_Tutor_ID,  
    PupilID = PupilID,  
    First_session_Date = First_session_Date,  
    Last_session_Date = Last_session_Date,  
    Online_bought = Online_bought,  
    Online_attended_pupil = as.character(Online_attended_pupil),  
    F2F_bought = F2F_bought,  
    F2F_attended_pupil = F2F_attended_pupil,  
    Whether_PP = factor(Whether_PP),  
    Whether_SEND = factor(Whether_SEND),  
    Main_subject = factor(Main_subject),  
    Year_Group = factor(Year_Group))  
  
pupil_columns <- length(names(pupil_data))  
  
### length check - TRUE  
pupil_columns_raw == pupil_columns
```

```
# Initial sample -----
### Initial Sample
# total in the tutor dataset
(total_tutor <- nrow(tutor_data))

# what tutors providers are present in the raw data
tutor_data %>%
  group_by(tp_name) %>%
  dplyr::summarise(n = dplyr::n())

# Sample tracking function -----

# Set as data.table
tutor_data <- setDT(tutor_data)

# no value for when I want to add no value
no_value <- tibble(rct_assignment = NA, NA)

# Tutor and pupil sample will be tracked at each stage of the cleaning by saving the latest figure to a tibble
sample_tracking <- tibble(stage = "Raw",
  tutor_sample = nrow(tutor_data),
  pupil_sample = nrow(pupil_data_raw),
  tutor_control = nrow(tutor_data[rct_assignment == "Control"]),
  tutor_treatment = nrow(tutor_data[rct_assignment == "Treatment"]),
  pupil_control = NA,
  pupil_treatment = NA)

sample_new_row <- function(Stage, Tutor, Pupil) {
  Pupil <- setDT(Pupil)
  print(Pupil[[1,1]])
  new_row <- tibble(stage = Stage,
    tutor_sample = nrow(Tutor),
    pupil_sample = if_else(is.na(Pupil[[1,1]]), NA_integer_, nrow(Pupil)),
    tutor_control = nrow(Tutor[rct_assignment == "Control"]),
    tutor_treatment = nrow(Tutor[rct_assignment == "Treatment"]),
    pupil_control = if_else(is.na(Pupil[[1,1]]), NA_integer_, nrow(Pupil[rct_assignment == "Control"])),
    pupil_treatment = if_else(is.na(Pupil[[1,1]]), NA_integer_, nrow(Pupil[rct_assignment ==
    "Treatment"])))
}
```

```
sample_tracking <- rbind(sample_tracking, new_row)
print(sample_tracking)
}
# pupil_control = if_else(is.na(Pupil[[1,1]]), NA_integer_, nrow(Pupil[rct_assignment == "Control"])),
# pupil_treatment = if_else(is.na(Pupil[[1,1]]), NA_integer_, nrow(Pupil[rct_assignment == "Treatment"]))

# NA as 0 -----

pupil_data <- pupil_data %>%
  mutate(Online_bought = if_else(is.na(Online_bought), "0", Online_bought),
         Online_attended_pupil = if_else(is.na(Online_attended_pupil), "0", Online_attended_pupil),
         F2F_bought = if_else(is.na(F2F_bought), "0", F2F_bought),
         F2F_attended_pupil = if_else(is.na(F2F_attended_pupil), "0", F2F_attended_pupil))

# Select only relevant TP partners -----

# The raw tutor dataset includes tutors that were involved in RCT 1, 2, and 3, the Trial protocol for RCT 1 states
# we used 4 providers for RCT 1, we will keep only these tutors

### filter only the tutors involved in this trial
tutor_data <- tutor_data %>%
  filter(tp_name == "The Tutor Trust" |
         tp_name == "TUTE" |
         tp_name == "Mannings" |
         tp_name == "School Partnership Tutors")

### total tutors part of this trial
(total_tutor_trial <- nrow(tutor_data))

# Set as data.table
tutor_data <- setDT(tutor_data)

# Update sample counter
sample_new_row("Relevant tutors", tutor_data, no_value)

# Clean duplicate tutors -----
```

```
# We have a variable called "New_Dup_Tutor_id" that allows us to identify duplicate pairs

# Set as data.table
tutor_data <- setDT(tutor_data)

# Get columns names
tutor_names <- names(tutor_data)

# See all those marked as duplicactes - there are 18 marked as duplicactes, however, it seems that there are some
pupils that are marked as duplicates that do not have a duplicate (e.g. there is not another another row where their
dupliacte id is present)
tutor_data[!is.na(New_Dup_Tutor_id)] #18 marked as duplicates

# Which are the true duplicates - 6 true duplicates (12 total rows)
true_duplicate <- tutor_data %>% filter(!is.na(New_Dup_Tutor_id)) %>% group_by(New_Dup_Tutor_id) %>%
dplyr::summarise(n = n()) %>% filter(n == 2) %>%
  pull(New_Dup_Tutor_id)

# dataset of true duplicates
data_true_duplicates <- tutor_data %>% filter(New_Dup_Tutor_id %in% true_duplicate)

#### see if any of the tutor ids would match with Pupils - the answer is n = 0 but because I want this code to robust
to any new data from SPT I have worked to completeness regardless

dup_test_1 <- tutor_data %>% filter(New_Dup_Tutor_id %in% true_duplicate)

left_join(dup_test_1, pupil_data, by = "BIT_Tutor_ID") # no pupils

#### duplicates that we are keeping
keep_dups_full <- data_true_duplicates[order(New_Dup_Tutor_id, batch_number), head(.SD, 1), keyby =
.(New_Dup_Tutor_id)]

# select columns we need to updated to correct IDs
keep_dups_for_cleaning <- keep_dups_full %>% mutate(BIT_Tutor_ID_keep = BIT_Tutor_ID) %>%
select(BIT_Tutor_ID_keep, New_Dup_Tutor_id)

#### duplicates that need their BIT_tutor_id to be correct
drop_dups_full <- data_true_duplicates[order(New_Dup_Tutor_id, -batch_number), head(.SD, 1), keyby =
.(New_Dup_Tutor_id)]
```

```
drop_dups_for_cleaning <- drop_dups_full %>% mutate(BIT_Tutor_ID_drop = BIT_Tutor_ID) %>%
select(BIT_Tutor_ID_drop, New_Dup_Tutor_id)

fix_tutor_ids <- full_join(keep_dups_for_cleaning, drop_dups_for_cleaning, by = "New_Dup_Tutor_id") %>%
select(BIT_Tutor_ID_keep, BIT_Tutor_ID_drop)

## update pupil data with the correct ID
pupil_data <- left_join(pupil_data, fix_tutor_ids, by = c("BIT_Tutor_ID" = "BIT_Tutor_ID_drop")) %>%
  mutate(BIT_Tutor_ID = if_else(!is.na(BIT_Tutor_ID_keep), BIT_Tutor_ID_keep, BIT_Tutor_ID))

# Select those who have duplicates by "New_Dup_Tutor_id", order by Batch number and select only the first row
# (this is specified in our analysis plan) and still keeps those who are marked as a duplicate but don't have a pair

#### these are the first assignment of the duplicates
tutor_dups_cleaned <- keep_dups_full

# we are going with first assignment
#tutor_dups_cleaned <- tutor_dups_cleaned %>% mutate(rct_assignment = "Treatment")

#reorder the columns as the data.table transformations above have changed this
tutor_dups_cleaned <- setcolorder(tutor_dups_cleaned, tutor_names)

# Merge cleaned dups and data w/o dups

# data w/o dups
tutor_data_no_dups <- tutor_data %>% filter(!New_Dup_Tutor_id %in% true_duplicate)

# cleaned dups
tutor_data_clean <- rbind(tutor_data_no_dups, tutor_dups_cleaned)

# update sample tracker
sample_new_row("Duplicates removed", tutor_data_clean, no_value)

# Merge cleaned Tutor and Pupil datasets -----
# We are using a left join merge here as we are attending to save all tutors and only merge those pupils who are
linked to a tutors in the cleaned data therefore the dataset represents
merged_data <- left_join(tutor_data_clean, pupil_data, by = "BIT_Tutor_ID")
```

```
# save raw version
merged_data_raw <- merged_data

# Check the amount of tutors is the same in the pre-merged clean dataset - TRUE
nrow(merged_data[!duplicated(merged_data$BIT_Tutor_ID), ]) == nrow(tutor_data_clean)

# update sample tracker save unique Tutor Ids and Pupil Ids
sample_new_row("Merged dataset", setDT(distinct(merged_data, BIT_Tutor_ID, .keep_all = TRUE)), Pupil =
distinct(merged_data, PupillID, .keep_all = TRUE))

# rows
nrow(merged_data)
nrow(merged_data[!duplicated(merged_data$PupillID), ])

duplicated(merged_data$BIT_Tutor_ID)
duplicated(merged_data$PupillID)

## How many rows are missing pupil id these should be the tutor's who have not been assigned a pupil
nrow(merged_data[is.na(PupillID)]) #871

## by filtering out rows where there are no pupil ids we can effectively remove all those tutors who were not assigned
a pupil.
merged_data <- merged_data %>%
  filter(!is.na(PupillID))

## How many distinct tutors are there after removing those without pupils
nrow(distinct(merged_data, BIT_Tutor_ID))

sample_new_row("Dropped tutors without pupils", setDT(distinct(merged_data, BIT_Tutor_ID, .keep_all = TRUE)),
setDT(distinct(merged_data, PupillID, .keep_all = TRUE)))

### Pupils duplicate check
merged_data %>%
  group_by(PupillID) %>%
  dplyr::summarise(n = n()) %>%
  arrange(desc(n)) %>%
  filter(n > 1)
```

```
# Date -----

## Remove those cases where the first session occurred before 21/2/2021

# how many have NA as first session data - 245
merged_data %>%
  filter(is.na(First_session_Date))

merged_data <- merged_data %>%
  mutate(First_session_Date = dmy(First_session_Date)) %>% # set as date data
  filter(First_session_Date > dmy("21/2/2021")) %>% # drop those who started early
  filter(!is.na(First_session_Date)) # drop those who we do not have a date for

sample_new_row("Clean date data", setDT(distinct(merged_data, BIT_Tutor_ID, .keep_all = TRUE)),
setDT(merged_data))

# make those with withdrawn as MISSING covar -----

merged_data %>%
  filter(Whether_PP == "Withdrawn" |
    Whether_SEND == "Withdrawn" |
    Year_Group == "Withdrawn") %>%
  table1(~rct_assignment | BIT_Tutor_ID, .)

merged_data <- merged_data %>%
  mutate(Whether_PP = if_else(Whether_PP == "Withdrawn", "MISSING", as.character(Whether_PP)),
    Whether_SEND = if_else(Whether_SEND == "Withdrawn", "MISSING", as.character(Whether_SEND)),
    Year_Group = if_else(Year_Group == "Withdrawn", "MISSING", as.character(Year_Group)))

# Drop WITHDRAWN outcomes

merged_data <- merged_data %>%
  filter(!Online_bought == "Withdrawn") %>%
  filter(!Online_attended_pupil == "Withdrawn") %>%
  filter(!F2F_bought == "Withdrawn") %>%
  filter(!F2F_attended_pupil == "Withdrawn")
```

```
table1(~Whether_SEND, merged_data)
```

```
# Values check -----
```

```
table1(~Online_bought, merged_data[tp_name == "Mannings"])
```

```
table1(~Online_bought, merged_data[tp_name == "School Partnership Tutors"])
```

```
table1(~Online_bought, merged_data[tp_name == "The Tutor Trust"])
```

```
table1(~Online_bought, merged_data[tp_name == "TUTE"])
```

```
table1(~factor(Online_attended_pupil), merged_data[tp_name == "Mannings"])
```

```
table1(~factor(Online_attended_pupil), merged_data[tp_name == "School Partnership Tutors"])
```

```
table1(~factor(Online_attended_pupil), merged_data[tp_name == "The Tutor Trust"])
```

```
table1(~factor(Online_attended_pupil), merged_data[tp_name == "TUTE"])
```

```
table1(~factor(Online_bought), merged_data)
```

```
table1(~factor(Online_attended_pupil), merged_data)
```

```
table1(~factor(F2F_bought), merged_data)
```

```
table1(~factor(F2F_attended_pupil), merged_data)
```

```
### investigation
```

```
merged_data %>% filter(Online_attended_pupil == 1.25)
```

```
# Understanding "BLANK"s -----
```

```
# We have 4 different variables that create the main outcome for this analysis however the below code demonstrates how interpreting some other the values in these variables is unclear, please refer to this document for a longer discussion: https://docs.google.com/document/d/1NsFAGvkrZryUncOtCO4txg5-JBRkFkOWAxISWLqWRaQ/edit
```

```
## Main question - Do 0 and BLANK mean the same thing? Is this constant across the different outcome variables?
```

```
### where are BLANKs in the 4 outcome columns
```

```
table1(~Online_bought + Online_attended_pupil, merged_data)
```

### in online there were both 0 and Blank values

```
merged_data %>%
```

```
  group_by(Online_bought) %>% dplyr::summarise(n = n()) %>% filter(Online_bought == "0" | Online_bought == "BLANK")
```

### all values

```
table1(~Online_bought, merged_data)
```

### in online attended there were both 0 and BLANK values

```
merged_data %>%
```

```
  group_by(Online_attended_pupil) %>% dplyr::summarise(n = n()) %>% filter(Online_attended_pupil == "0" | Online_attended_pupil == "BLANK")
```

### all values

```
table1(~Online_attended_pupil, merged_data)
```

### in F2F there were no value of 0

```
merged_data %>%
```

```
  group_by(F2F_bought) %>% dplyr::summarise(n = n()) %>% filter(F2F_bought == "0" | F2F_bought == "BLANK")
```

### all values

```
table1(~F2F_bought, merged_data)
```

### in F2F attended there were both 0 and BLANK values

```
merged_data %>%
```

```
  group_by(F2F_attended_pupil) %>% dplyr::summarise(n = n()) %>% filter(F2F_attended_pupil == "0" | F2F_attended_pupil == "BLANK")
```

### all values

```
table1(~F2F_attended_pupil, merged_data)
```

# Observations

# What does "BLANK" in the pupil data columns "Online\_bought", "Online\_attended\_pupil", "F2F\_bought", "F2F\_attended\_pupil" represent?

# Judging from the the context of the data "BLANK" could mean NA or 0. However, when exploring the data further we noticed that in "Online\_bought" - pupils can take the value 0 or "BLANK" however in "F2F\_bought" they only take "BLANK" and never 0.

# Create type (online bought and attended combos) and type 2 (f2f bought and attended combos) this is in a TEMP dataset and redone below for the final dataset

```
# TEMP <- merged_data %>%

# mutate(Online_bought = as.integer(if_else(Online_bought == "BLANK", "-99", Online_bought)), ### treating
them differently as discussed above

#           Online_attended_pupil = as.numeric(if_else(Online_attended_pupil == "BLANK", "-99",
Online_attended_pupil))) %>% ### treating them differently as discussed above

# mutate(type = case_when(Online_bought == -99 & Online_attended_pupil == -99 ~ "BLANK & BLANK",
#           Online_bought == -99 & Online_attended_pupil > 0 ~ "BLANK & >0",
#           Online_bought == -99 & Online_attended_pupil == 0 ~ "BLANK & 0",
#           Online_bought > 0 & Online_attended_pupil == -99 ~ "0 & BLANK",
#           Online_bought == 0 & Online_attended_pupil == 0 ~ "0 & 0",
#           Online_bought > 0 & Online_attended_pupil == -99 ~ ">0 & BLANK",
#           Online_bought > 0 & Online_attended_pupil > 0 ~ ">0 & >0",
#           Online_bought > 0 & Online_attended_pupil == 0 ~ ">0 & 0"
# )) %>%

# mutate(F2F_bought = as.integer(if_else(F2F_bought == "BLANK", "-99", F2F_bought)), ### treating them
differently as discussed above

#           F2F_attended_pupil = as.numeric(if_else(F2F_attended_pupil == "BLANK", "-99", F2F_attended_pupil)))
%>% ### treating them differently as discussed above

# mutate(type2 = case_when(F2F_bought == -99 & F2F_attended_pupil == -99 ~ "BLANK & BLANK",
#           F2F_bought == -99 & F2F_attended_pupil > 0 ~ "BLANK & >0",
#           F2F_bought > 0 & F2F_attended_pupil == -99 ~ ">0 & BLANK",
#           F2F_bought > 0 & F2F_attended_pupil > 0 ~ ">0 & >0",
#           F2F_bought > 0 & F2F_attended_pupil == 0 ~ ">0 & 0"))

TEMP <- merged_data %>%

  mutate(Online_bought = as.integer(if_else(Online_bought == "BLANK", "-99", Online_bought)),
         Online_attended_pupil = as.integer(if_else(Online_attended_pupil == "BLANK", "-99",
Online_attended_pupil))) %>%

  mutate(type = case_when(Online_bought == -99 & Online_attended_pupil == -99 ~ "BLANK & BLANK",
                           Online_bought == -99 & Online_attended_pupil > 0 ~ "BLANK & >0",
                           Online_bought == -99 & Online_attended_pupil == 0 ~ "BLANK & 0",
                           Online_bought > 0 & Online_attended_pupil == -99 ~ "0 & BLANK",
                           Online_bought == 0 & Online_attended_pupil == 0 ~ "0 & 0",
                           Online_bought > 0 & Online_attended_pupil == -99 ~ ">0 & BLANK",
                           Online_bought > 0 & Online_attended_pupil > 0 ~ ">0 & >0",
                           Online_bought > 0 & Online_attended_pupil == 0 ~ ">0 & 0"

  )) %>%
```

```
mutate(F2F_bought = as.integer(if_else(F2F_bought == "BLANK", "-99", F2F_bought)), ### treating them  
differently as discussed above
```

```
  F2F_attended_pupil = as.integer(if_else(F2F_attended_pupil == "BLANK", "-99", F2F_attended_pupil)))  
%>% ### treating them differently as discussed above
```

```
mutate(type2 = case_when(F2F_bought == -99 & F2F_attended_pupil == -99 ~ "BLANK & BLANK",  
  F2F_bought == -99 & F2F_attended_pupil > 0 ~ "BLANK & >0",  
  F2F_bought > 0 & F2F_attended_pupil == -99 ~ ">0 & BLANK",  
  F2F_bought > 0 & F2F_attended_pupil > 0 ~ ">0 & >0",  
  F2F_bought > 0 & F2F_attended_pupil == 0 ~ ">0 & 0",  
  F2F_bought == 0 & F2F_attended_pupil == 0 ~ "0 & 0",  
  F2F_bought == -99 & F2F_attended_pupil == 0 ~ "BLANK & 0"))
```

```
# as DT
```

```
TEMP <- setDT(TEMP)
```

```
# cross tab of the online and F2f combos
```

```
table1(~ type, TEMP) # no missing all combos that exist are accounted for
```

```
table1(~ type2, TEMP) # no missing all combos that exist are accounted for
```

```
# this is the most contentious category as described in the above document
```

```
TEMP %>%
```

```
  filter(type == "BLANK & >0") %>%
```

```
  group_by(tp_name) %>%
```

```
  dplyr::summarise(n = n())
```

```
# BLANKS analysis (after speaking with Alex and Giulia) -----
```

```
# amount of tutors per TP provider
```

```
TEMP %>%
```

```
  group_by(tp_name) %>%
```

```
  distinct(PupilID) %>%
```

```
  dplyr::summarise(n = n())
```

```
# amount of pupils per TP provider
```

```
TEMP %>%
```

```
  group_by(tp_name) %>%
```

```
distinct(BIT_Tutor_ID) %>%
dplyr::summarise(n = n())

# same tables as above but per tutor provider
provider <- c("The Tutor Trust", "TUTE", "Mannings", "School Partnership Tutors")

for (i in 1:length(provider)) {
  TEMP_temp <- TEMP %>%
    filter(tp_name == provider[[i]])
  print(TEMP_temp)
  print(table1(~type, TEMP_temp, rowlabelhead = provider[[i]]))
}

TEMP <- TEMP %>%
  mutate(Online_bought_BLANK = if_else(Online_bought == -99, "BLANK", "VALUE"))
table1(~tp_name | Online_bought_BLANK, TEMP, droplevels = TRUE)

table1(~tp_name | Online_bought_BLANK + rct_assignment , TEMP, droplevels = TRUE)

table1(~type | tp_name + rct_assignment , TEMP)

TEMP <- setDT(TEMP)

table1(~type | tp_name + rct_assignment , TEMP[!duplicated(BIT_Tutor_ID)])

# This table allows us to understand where the 'to drop' are -- they will be the 'don't' cols

TEMP <- TEMP %>%
  mutate(type2_binary = if_else(type2 == ">0 & 0" | type2 == ">0 & >0", "Do", "Don't"))

TEMP %>%
  filter(tp_name == "School Partnership Tutors") %>%
  table1(~type | type2_binary, .)

for (i in 1:length(provider)) {
  TEMP_temp <- TEMP %>%
    filter(tp_name == provider[[i]])
```

```

print(TEMP_temp)
print(table1(~type | type2_binary, TEMP_temp, rowlabelhead = provider[[i]]))
}
# Current treatment of BLANKs -----

### Create indicator of BLANK combos to drop those we will not analysis and impute

merged_data <- merged_data %>%
  mutate(Online_bought = as.integer(if_else(Online_bought == "BLANK", "-99", Online_bought)),
         Online_attended_pupil = as.integer(if_else(Online_attended_pupil == "BLANK", "-99",
Online_attended_pupil))) %>%
  mutate(online_indicator = case_when(Online_bought == -99 & Online_attended_pupil == -99 ~ "BLANK &
BLANK",
                                     Online_bought == -99 & Online_attended_pupil > 0 ~ "BLANK & >0",
                                     Online_bought == -99 & Online_attended_pupil == 0 ~ "BLANK & 0",
                                     Online_bought > 0 & Online_attended_pupil == -99 ~ "0 & BLANK",
                                     Online_bought == 0 & Online_attended_pupil == 0 ~ "0 & 0",
                                     Online_bought > 0 & Online_attended_pupil == -99 ~ ">0 & BLANK",
                                     Online_bought > 0 & Online_attended_pupil > 0 ~ ">0 & >0",
                                     Online_bought > 0 & Online_attended_pupil == 0 ~ ">0 & 0"
                                     )) %>%
  mutate(F2F_bought = as.integer(if_else(F2F_bought == "BLANK", "-99", F2F_bought)), ### treating them
differently as discussed above
         F2F_attended_pupil = as.integer(if_else(F2F_attended_pupil == "BLANK", "-99", F2F_attended_pupil)))
%>% ### treating them differently as discussed above
  mutate(f2f_indicator = case_when(F2F_bought == -99 & F2F_attended_pupil == -99 ~ "BLANK & BLANK",
                                   F2F_bought == -99 & F2F_attended_pupil > 0 ~ "BLANK & >0",
                                   F2F_bought > 0 & F2F_attended_pupil == -99 ~ ">0 & BLANK",
                                   F2F_bought > 0 & F2F_attended_pupil > 0 ~ ">0 & >0",
                                   F2F_bought > 0 & F2F_attended_pupil == 0 ~ ">0 & 0",
                                   F2F_bought == 0 & F2F_attended_pupil == 0 ~ "0 & 0",
                                   F2F_bought == -99 & F2F_attended_pupil == 0 ~ "BLANK & 0"))

# cross tab of the online and F2F combos
table1(~ online_indicator, merged_data)
table1(~ f2f_indicator, merged_data)

table1(~ f2f_indicator | online_indicator, merged_data)

```

```
merged_data %>% filter(F2F_bought == -99 & Online_bought == -99)

## How we are handling them

# Get mode for all 4 tutoring providers after removing "BLANKS" which are stored as -99

Mode <- function(x) {
  ux <- unique(x)
  ux[which.max(tabulate(match(x, ux)))]
}

tp_modes <- merged_data %>%
  filter(Online_bought != -99) %>%
  group_by(tp_name) %>%
  dplyr::summarise(online_bought_median = Mode(Online_bought))

merged_data %>%
  filter(Online_bought == -99) %>%
  group_by(tp_name) %>%
  dplyr::summarise(n = n())

merged_data %>%
  group_by(tp_name) %>%
  dplyr::summarise(n = n())

mode <- as.integer(15)
zero <- as.integer(0)

merged_data <- merged_data %>%
  mutate(Online_bought_cleaned = case_when(online_indicator == ">0 & >0" ~ Online_bought,
                                           online_indicator == ">0 & 0" ~ Online_bought,
                                           online_indicator == ">0 & BLANK" ~ Online_bought,
                                           online_indicator == "0 & 0" ~ zero,
                                           online_indicator == "BLANK & >0" ~ mode,
                                           online_indicator == "BLANK & 0" ~ zero,
                                           online_indicator == "BLANK & BLANK" ~ zero)) %>%
```

```
mutate(Online_attended_pupil_cleaned = case_when(online_indicator == ">0 & >0" ~ Online_attended_pupil,  
  online_indicator == ">0 & 0" ~ zero,  
  online_indicator == ">0 & BLANK" ~ zero,  
  online_indicator == "0 & 0" ~ zero,  
  online_indicator == "BLANK & >0" ~ Online_attended_pupil,  
  online_indicator == "BLANK & 0" ~ zero,  
  online_indicator == "BLANK & BLANK" ~ zero))
```

```
table1(~factor(Online_bought_cleaned), merged_data)  
table1(~factor(Online_attended_pupil_cleaned), merged_data)
```

### F2F

```
merged_data <- merged_data %>%  
  mutate(F2F_bought_cleaned = case_when(f2f_indicator == ">0 & >0" ~ F2F_bought,  
    f2f_indicator == ">0 & 0" ~ F2F_bought,  
    f2f_indicator == ">0 & BLANK" ~ F2F_bought,  
    f2f_indicator == "0 & 0" ~ zero,  
    f2f_indicator == "BLANK & >0" ~ mode,  
    f2f_indicator == "BLANK & 0" ~ zero,  
    f2f_indicator == "BLANK & BLANK" ~ zero)) %>%  
  mutate(F2F_attended_pupil_cleaned = case_when(f2f_indicator == ">0 & >0" ~ F2F_attended_pupil,  
    f2f_indicator == ">0 & 0" ~ zero,  
    f2f_indicator == ">0 & BLANK" ~ zero,  
    f2f_indicator == "0 & 0" ~ zero,  
    f2f_indicator == "BLANK & >0" ~ F2F_attended_pupil,  
    f2f_indicator == "BLANK & 0" ~ zero,  
    f2f_indicator == "BLANK & BLANK" ~ zero))
```

```
table1(~factor(F2F_bought_cleaned), merged_data)  
table1(~factor(F2F_attended_pupil_cleaned), merged_data)
```

```
merged_data %>% filter(is.na(F2F_bought_cleaned))
```

# had no lessons bought -----

```
merged_data <- merged_data %>% filter(!(F2F_bought_cleaned == 0 & Online_bought == 0))

sample_new_row("No lessons bought", merged_data[!duplicated(merged_data$BIT_Tutor_ID)], merged_data)

merged_data %>% filter(is.na(F2F_attended_pupil_cleaned) | is.na(Online_attended_pupil_cleaned)) ### 0 pupils
had missing data in these attended outcomes


sample_new_row("No hours attended", merged_data[!duplicated(merged_data$BIT_Tutor_ID)], merged_data)

# Outcome definition -----

# amount of pupils / proportion of pupils that did not have any lessons bought then
nrow(merged_data[(Online_bought_cleaned == 0 & F2F_bought_cleaned == 0)])/nrow(merged_data)

# merged_data <- merged_data[!(Online_bought_cleaned == 0 & F2F_bought_cleaned == 0)]

# Drop those who have 0 across all outcomes
merged_data <- merged_data[!(Online_attended_pupil_cleaned == 0 &
  F2F_attended_pupil_cleaned == 0 &
  Online_bought_cleaned == 0 &
  F2F_bought_cleaned == 0)]

sample_new_row("0 across all outcomes", merged_data[!duplicated(merged_data$BIT_Tutor_ID)], merged_data)

# Outcome definition (BIT) outcome - no extra dropping mode 15 imputed
data_outcome_clean <- merged_data %>%
  mutate(overall_outcome = (Online_attended_pupil_cleaned + F2F_attended_pupil_cleaned) /
(Online_bought_cleaned + F2F_bought_cleaned)) %>% #create raw outcome
  mutate(overall_outcome = if_else(overall_outcome > 1, 1, overall_outcome)) #cap attendance at 100%

table1(~overall_outcome, data_outcome_clean)
```

```
sample_new_row("BLANKS", "Cleaned",
data_outcome_clean[!duplicated(data_outcome_clean$BIT_Tutor_ID)][!is.na(overall_outcome)],
data_outcome_clean[!is.na(overall_outcome)])

# Outcome definition (NYER alternative) - extra dropping required -----

data_outcome_clean <- data_outcome_clean %>%
  mutate(overall_outcome_2 = if_else(online_indicator == "BLANK & 0", NA_real_, overall_outcome)) #cap
attendance at 100%

table1(~overall_outcome_2, data_outcome_clean) # Missing 2137 (25.9%) we are dropping about 25% of
observations

# ignore -----

# drop <- as.integer(-999)
#
## data_outcome_clean <- data_outcome_clean %>%
##   mutate(Online_bought_cleaned_2 = case_when(online_indicator == ">0 & >0" ~ Online_bought,
##   online_indicator == "BLANK & 0" ~ drop,
##   online_indicator == "BLANK & BLANK" ~ zero,
##   online_indicator == "0 & 0" ~ Online_bought,
##   online_indicator == "BLANK & >0" ~ mode))
#
## data_outcome_clean_2 <- data_outcome_clean %>%
##   filter(!online_indicator == "BLANK & 0")
#
##
## table1(~factor(Online_bought_cleaned), data_outcome_clean_2)
## table1(~factor(Online_attended_pupil_cleaned), data_outcome_clean_2)
#
#
## data_outcome_clean_2 <- data_outcome_clean_2 %>%
#   mutate(overall_outcome_2 = (Online_attended_pupil_cleaned + F2F_attended_pupil_cleaned) /
(Online_bought_cleaned + F2F_bought_cleaned)) %>% #create raw outcome
##   mutate(overall_outcome_2 = if_else(overall_outcome_2 > 1, 1, overall_outcome_2)) #cap attendance at 100%
##
```

```
##
##
##
## table1(~overall_outcome_2, data_outcome_clean_2)
## table1(~overall_outcome_2, data_outcome_clean_2)

# all variables cleaned -----

# Update sample counter
sample_new_row("Outcomes", 1,
data_outcome_clean[!duplicated(data_outcome_clean$BIT_Tutor_ID)][!is.na(overall_outcome)],
data_outcome_clean[!is.na(overall_outcome)])

sample_new_row("Outcomes", 2,
data_outcome_clean[!duplicated(data_outcome_clean$BIT_Tutor_ID)][!is.na(overall_outcome_2)],
data_outcome_clean[!is.na(overall_outcome_2)])

sample_tracking

data_export <- data_outcome_clean
table1(~tp_name | rct_assignment, data_export[!duplicated(BIT_Tutor_ID)])
data_export %>%
  distinct(BIT_Tutor_ID)

# Check balance after cleaning -----

# Tutor level balance checks for rct_assignment X tp_provider
# Outcome 1
table1(~tp_name | rct_assignment, distinct(data_export, BIT_Tutor_ID, .keep_all = TRUE))

# chi square test
for_chi_square <- distinct(data_export, BIT_Tutor_ID, .keep_all = TRUE)

chisq.test(table(for_chi_square$tp_name, for_chi_square$rct_assignment, exclude = c("Coach Bright", "Action
Tutoring", "TAP")))

# Outcome 2
```

```
table1(~tp_name | rct_assignment, distinct(data_export[!is.na(overall_outcome_2)], BIT_Tutor_ID, .keep_all = TRUE))
```

```
# chi square test
```

```
for_chi_square_2 <- for_chi_square[!is.na(overall_outcome_2)]
```

```
chisq.test(table(for_chi_square_2$tp_name, for_chi_square_2$rct_assignment, exclude = c("Coach Bright", "Action Tutoring", "TAP")))
```

```
data_export %>%
```

```
  group_by(BIT_Tutor_ID, rct_assignment) %>%
```

```
  dplyr::summarise(n = n()) %>%
```

```
  ungroup() %>%
```

```
  group_by(rct_assignment) %>%
```

```
  dplyr::summarise(n = sum(n))
```

```
# PP
```

```
table1(~Whether_PP | rct_assignment, data_export)
```

```
data_export %>% filter(!Whether_PP == "MISSING") %>%
```

```
  table1(~Whether_PP | rct_assignment, .)
```

```
# Mean attendance
```

```
table1(~overall_outcome | rct_assignment, data_export)
```

```
data_export %>% filter(First_session_Date < ymd("2021/05/1")) %>%
```

```
  table1(~overall_outcome | rct_assignment, .)
```

```
data_export %>% filter(First_session_Date > ymd("2021/05/1")) %>%
```

```
  table1(~overall_outcome | rct_assignment, .)
```

```
# SEND
```

```
table1(~Whether_SEND | rct_assignment, data_export)
```

```
# YEAR group
```

```
table1(~Year_Group | rct_assignment, data_export)
```

```
# MAIN SUBJECT
table1(~Main_subject | rct_assignment, data_export)

#
table1(~overall_outcome | rct_assignment, data_export)

table1(~overall_outcome_2 | rct_assignment, data_export)


# Tables -----

sample_tracking


# Power calcs -----

data_export %>% group_by(BIT_Tutor_ID) %>% dplyr::summarise(n = n()) %>% summarise(mean = mean(n))

data_export_pp <- data_export %>% filter(Whether_PP == "Y")

sample_new_row("PP sample", data_export_pp[!duplicated(data_export_pp$BIT_Tutor_ID)], data_export_pp)

data_export_pp %>% group_by(BIT_Tutor_ID) %>% dplyr::summarise(n = n()) %>% summarise(mean = mean(n))

data_export %>%
  select(BIT_Tutor_ID, overall_outcome) %>% pivot_wider()


## full sample
library(pwr)
library(psych)
icc_data <- data_export %>% select(BIT_Tutor_ID, overall_outcome) %>% group_by(BIT_Tutor_ID) %>% nest()
```

```
icc_cleaned <- tibble()
```

```
a <- icc_data[[1,2]]
```

```
for (i in 1:nrow(icc_data)) {  
  icc_cleaned <- icc_cleaned %>% add_column(icc_data[[1,2]])  
}
```

```
clusterSize <- 12.72753
```

```
nClusters <- 701
```

```
ICC <- 0.37
```

```
effectiveN <- nClusters * clusterSize/(1+ICC*(clusterSize-1))
```

```
pwr.t.test(n=effectiveN,power=0.8)$d * SD(data_export$overall_outcome)
```

```
clusterSize <- 6.392405
```

```
nClusters <- 632
```

```
ICC <- 0.37
```

```
effectiveN <- nClusters * clusterSize/(1+ICC*(clusterSize-1))
```

```
pwr.t.test(n=effectiveN,power=0.8)$d * SD(data_export_pp$overall_outcome)
```

```
reg1 <- lmer(overall_outcome ~ 1 + rct_assignment + (1 |BIT_Tutor_ID), data_export)
```

```
tab_model(reg1)
```

```
reg1 <- lmer(overall_outcome ~ 1 + rct_assignment + (1 |BIT_Tutor_ID), data_export_pp)
```

```
tab_model(reg1)
```

```
# Missing Check -----
```

```
table1(~Whether_PP | rct_assignment, data_export) # 7.9% - drop from regression
```

```
table1(~Whether_SEND | rct_assignment, data_export) # 12% - drop from regression
```

```
table1(~Year_Group | rct_assignment, data_export) # 3.2%
```

```
data_export$Year_Group <- if_else(is.na(data_export$Year_Group), "MISSING", data_export$Year_Group)
```

```

table1(~Main_subject | rct_assignment, data_export) # 0%

table1(~tp_name | rct_assignment, data_export) # 0%

table1(~batch_number | rct_assignment, data_export) # 0%

table1(~Tutor_gender | rct_assignment, data_export) # 0.2%
data_export$Tutor_gender <- if_else(is.na(data_export$Tutor_gender), "MISSING", data_export$Tutor_gender)

table1(~Tutor_experience | rct_assignment, data_export) # 1.3%

# Blinded data for replication -----

data_blind <- data_export %>% select(BIT_Tutor_ID, PupilID, tp_name, rct_assignment, Tutor_gender,
Tutor_experience, Whether_PP, Whether_SEND, Main_subject, Year_Group, batch_number, overall_outcome)
%>%

  mutate(rct_assignment = case_when(rct_assignment == "Control" ~ "Michu",
                                    rct_assignment == "Treatment" ~ "Vardy"))

DATE <- Sys.Date()

write_csv(data_blind, paste0("/Volumes/GoogleDrive/.shortcut-targets-by-
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1
— Birds of a feather/Replication Analysis/T1-Input/blinded_data_", DATE, ".csv"))

# Export data -----

DATE <- Sys.Date()

# write_csv(data_export, paste0("/Volumes/GoogleDrive/.shortcut-targets-by-
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1
— Birds of a feather/Analysis/T3-Output/data_cleaned_", DATE, ".csv"))

# saveRDS(data_export, paste0("/Volumes/GoogleDrive/.shortcut-targets-by-
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1
— Birds of a feather/Analysis/T3-Output/data_cleaned_", DATE, ".rds"))

```

Analysis code:

```
#### NTP RCT 1 - ANALYSIS coode
```

```
# AUTHOR: Pujen Shrestha
```

```
# DATE: 24/11/2021
```

```
# PROJECT: National Tutoring Programme, RCT 1
```

```
# Report to-do's here: https://docs.google.com/document/d/1RyhjWM7OwCOCeZ-zfHjgJRLrqXLoSJpaW9sgE\_kVMHY/edit#
```

```
# Set-up -----
```

```
#rm(list = ls()) #clear environment
```

```
#### Load packages w/ comment for use
```

```
library(tidyverse) # main data manipulation functions
```

```
library(data.table) # seconfary data manipulation functions
```

```
library(multiwayvcov) # for clustered standard errors
```

```
library(lmtest) # for clustered standard errors
```

```
library(effectsize) # for hedges g
```

```
# Set-up -----
```

```
library(lfe)
```

```
library(TREX)
```

```
library(scales)
```

```
library(lemon)
```

```
library(lubridate)
```

```
library(readxl)
```

```
library(lme4)
```

```
library("writexl")
```

```
library(Rmisc)
```

```
library(table1)
```

```
# Extra Edited Functions -----
```

```
#### An adjusted version of the bit bar plot function that allows me to limit the ylim
```

```
BIT_barplot_adjusted <- function (y, barXLabels, barYLabels = comma(y), CIMax = y, CIMin = CIMax -  
  2 * (CIMax - y), p, N, analysisType = c("descriptive", "primary",
```

```

        "secondary", "exploratory"), ylab = substitute(y), main = NULL,
        col.main = BITBlue, line.main = -2, las.main = 0.5, file = NULL,
        filetype = grDevices::pdf, controlGroup = TRUE, barCol = BITBlue,
        add = FALSE, CIColor = BITOrange2, subtitle = "** p<0.01, * p<0.05, + p<0.1",
        extramar = 0, yline = 0, ...)
{
  if (!missing(file)) {
    if (filetype == "pdf")
      pdf(file, width = 9, height = 5.433071)
    if (filetype == "png") {
      if (.Platform$OS.type == "unix")
        png(file, height = 600, width = 600 + 120 *
          max(0, length(y) - 3), type = "cairo", family = "Futura")
      else png(file, height = 600, width = 600 + 120 *
        max(0, length(y) - 3))
    }
    on.exit(dev.off())
  }
  analysisType <- match.arg(analysisType)
  if (!missing(N))
    subtitle <- paste0("N=", comma(N), "\n", subtitle)
  if (analysisType != "descriptive")
    subtitle <- paste0(subtitle, "\n", analysisType, " analysis")
  if (is.numeric(barYLabels))
    barYLabels <- comma(barYLabels)
  mai <- c(1.22 + extramar/4, 1.02 + 0.2 * max(0, log10(max(y,
    1, na.rm = TRUE)) - 2), 0.42, 0.42)
  mar <- c(5.1 + extramar, 5.1 + max(0, log10(max(y, 1, na.rm = TRUE))),
    4.1, 2.1)
  opar <- graphics::par(mai = mai, mar = mar, family = "futura")
  on.exit(graphics::par(opar))
  graphics::barplot(y, names.arg = barXLabels, col = c(if (controlGroup) BITBlack else barCol,
    rep(barCol, length(y) - 1)), yaxt = "n", border = NA,
    space = 0.3, font = 20, cex.axis = 18/12, cex = 18/12,
    ylim = c(0, 80), sub = subtitle, adj = 0,
    font.sub = 20, las = las.main, add = add, family = "futura",
    ...)
  yTickLabels <- comma(graphics::axTicks(2))

```

```

if (!add) {
  graphics::axis(side = 2, font = 20, cex = 18/12, cex.axis = 18/12,
    labels = yTickLabels, at = graphics::axTicks(2),
    las = 1)
  if (!missing(main)) {
    graphics::title(main = main, font = 20, font.main = 20,
      las = 0.5, cex.main = 24/12, col.main = col.main,
      line = line.main)
  }
  graphics::mtext(ylab, side = 2, line = max(0, log10(max(y,
    1)) + 2) + yline, font = 20, cex = 18/12)
}
if (!missing(p))
  for (i in seq_along(p)) graphics::text(i * 1.3 - 0.1,
    y[i] + max(y) * 0.025, if (p[i] < 0.01)
      "***"
    else if (p[i] < 0.05)
      "**"
    else if (p[i] < 0.1)
      "+"
    else "", cex = 16/12, )
graphics::text(seq_along(y) * 1.3 - 0.5, ifelse(CIMin >
  max(CIMax)/(9 - extramar/2), y - max(y)/10 - ifelse(missing(CIMax) |
  CIMax == y, 0, y - CIMin), y + max(y)/15 +
  ifelse(missing(CIMax) |
  CIMax == y, 0,
  CIMax - y)), barYLabels, font = 20, cex = 28/12 *
  (5/max(5, nchar(barYLabels))), col = ifelse(CIMin >
    max(CIMax)/9, "white", "black"))
if (!missing(CIMax)) {
  for (i in seq_along(CIMax)) {
    if (CIMax[i] == y[i])
      next
    graphics::segments(i * 1.3 - 0.5, CIMax[i], i *
      1.3 - 0.5, CIMin[i], col = CIColor, lwd = 2.5)
    graphics::segments(i * 1.3 - 0.45, CIMax[i], i *
      1.3 - 0.55, CIMax[i], col = CIColor, lwd = 2.5)
    graphics::segments(i * 1.3 - 0.45, CIMin[i], i *
      1.3 - 0.55, CIMin[i], col = CIColor, lwd = 2.5)
  }
}

```

```
}  
}  
}  
  
# read data -----  
  
#           data_analysis           <-           read_csv("/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/data_cleaned_2021-12-02.csv")  
  
data_analysis           <-           readRDS("/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/data_cleaned_2022-01-20.rds")  
  
data_analysis <- setDT(data_analysis)  
  
# Tutor attrition -----  
# Analysis n  
analysis_treatment <- data_analysis %>% distinct(BIT_Tutor_ID, .keep_all = TRUE) %>% filter(rct_assignment ==  
"Treatment") %>% nrow()  
  
analysis_control <- data_analysis %>% distinct(BIT_Tutor_ID, .keep_all = TRUE) %>% filter(rct_assignment ==  
"Control") %>% nrow()  
  
analysis_total <- data_analysis %>% distinct(BIT_Tutor_ID, .keep_all = TRUE) %>% nrow()  
  
# Randomisation n  
#           These           values           can           be           found  
https://docs.google.com/document/d/1u4jhjSimvjR75sYUtE1Bq0vXv3dmePLKriN8IXivJYQ/edit# (note that the  
original numbers are greater than actual tutors randomised Dave and Riz were used in each batch to ensure  
impletmentation fidelity)  
rand_total <- 1714  
rand_control <- 858  
rand_treatment <- 856  
  
drop_treatment <- rand_treatment - analysis_treatment  
drop_control <- rand_control - analysis_control  
drop_total <- rand_total - analysis_total  
  
drop_per_treatment <- drop_treatment/rand_treatment
```

```
drop_per_control <- drop_control/rand_control
drop_per_total <- drop_total/rand_total

attrition <- tibble(control = c(rand_control, analysis_control, drop_control, drop_per_control),
                    treatment = c(rand_treatment, analysis_treatment, drop_treatment, drop_per_treatment),
                    total = c(rand_total, analysis_total, drop_total, drop_per_total))

### Attrition Table
attrition

# MISSING check -----
### conduct a missininess check for all covars

table1(~Whether_PP | rct_assignment, data_analysis) # 7.9% - drop from regression

table1(~Whether_SEND | rct_assignment, data_analysis) # 12% - drop from regression

table1(~Year_Group | rct_assignment, data_analysis) # 5.4% - drop from regression

table1(~Main_subject | rct_assignment, data_analysis) # 0%

table1(~tp_name | rct_assignment, data_analysis) # 0%

table1(~batch_number | rct_assignment, data_analysis) # 0%

table1(~Tutor_gender | rct_assignment, data_analysis) # 0.2%

table1(~Tutor_experience | rct_assignment, data_analysis) # 0.5%
table1(~Tutor_experience | rct_assignment, data_analysis[!duplicated(BIT_Tutor_ID)]) # 1.4%

### randomisation balance
table1(~tp_name | rct_assignment, data_analysis[!duplicated(BIT_Tutor_ID)])

# correct data type -----

str(data_analysis)
```

```
# correct data type
data_analysis <- data_analysis %>%
  mutate(batch_number = factor(batch_number),
         rct_assignment = factor(rct_assignment),
         Tutor_gender = factor(Tutor_gender),
         Tutor_experience = factor(Tutor_experience),
         First_session_Date = ymd(First_session_Date),
         Last_session_Date = dmy(Last_session_Date),
         Whether_PP = factor(Whether_PP),
         Whether_SEND = factor(Whether_SEND),
         Year_Group = factor(Year_Group),
         Main_subject = factor(Main_subject))

# correct reference category
data_analysis$rct_assignment <- relevel(data_analysis$rct_assignment, ref = "Control")
data_analysis$batch_number <- relevel(data_analysis$batch_number, ref = "1")
data_analysis$Tutor_gender <- relevel(data_analysis$Tutor_gender, ref = "F")
data_analysis$Tutor_experience <- relevel(data_analysis$Tutor_experience, ref = "1 - 2 Years")
data_analysis$Whether_PP <- relevel(data_analysis$Whether_PP, ref = "Y")
data_analysis$Whether_SEND <- relevel(data_analysis$Whether_SEND, ref = "Y")
data_analysis$Year_Group <- relevel(data_analysis$Year_Group, ref = "10")
data_analysis$Main_subject <- relevel(data_analysis$Main_subject, ref = "English")

# recode covars for participant check -----
data_part_check_pupils <- data_analysis %>%
  mutate(whether_pp = factor(if_else(Whether_PP == "Y", 1, 0)),
         whether_send = factor(if_else(Whether_SEND == "Y", 1, 0)),
         year_group = factor(if_else(Year_Group == 10, 1, 0)))

# The participant check is all done at the pupils level
#### Participant Characteristics Table
table1(~year_group | rct_assignment, data_part_check_pupils)
table1(~whether_pp | rct_assignment, data_part_check_pupils)
table1(~whether_send | rct_assignment, data_part_check_pupils)
table1(~Main_subject | rct_assignment, data_part_check_pupils)
table1(~Tutor_gender | rct_assignment, data_part_check_pupils)
table1(~tp_name | rct_assignment, data_part_check_pupils)
table1(~batch_number | rct_assignment, data_part_check_pupils)
```

```
# Balance checks -----

# Treatment and control

# PP
table1(~Whether_PP | rct_assignment, data_analysis)

# SEND
table1(~Whether_SEND | rct_assignment, data_analysis)

# YEAR group
table1(~Year_Group | rct_assignment, data_analysis)

# MAIN SUBJECT
table1(~Main_subject | rct_assignment, data_analysis)

# Raw Rates
table1(~overall_outcome | rct_assignment, data_analysis)

#table1(~overall_outcome_2 | rct_assignment, data_analysis)

# Clean tp_name * batch without individual terms -----
### In RCT2 we didn't include the individual effects for tp_name and batch number just the interaction terms,
because you cant drop these easily in R i have create this variable
data_analysis <- data_analysis %>%
  mutate(tp_batch = paste0(tp_name, "_", batch_number))

# Overall regressions -----

### Regression 1
table1(~overall_outcome | rct_assignment, data_analysis)

treatment_outcomes <- data_analysis %>% filter(rct_assignment == "Treatment") %>% select(overall_outcome)
CI(treatment_outcomes$overall_outcome, ci = 0.95)
```

```
control_outcomes <- data_analysis %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes$overall_outcome, ci = 0.95)

reg1 <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender + Tutor_experience
+ tp_batch, data_analysis)
summary(reg1)

### Yihan taught version (this is the version I am going to stick with as it is from the TREX package)
reg1_rsr <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + Tutor_experience + tp_batch',
                             data = data_analysis, cluster = data_analysis$BIT_Tutor_ID)

### Tom taught version
# reg1_robust_sr <- cluster.vcov(reg1, data_analysis$BIT_Tutor_ID)
# coeftest(reg1, reg1_robust_sr)
#
# BITplot(reg1)

# Reg 1 Plot -----

raw_control <- data_analysis %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw =
mean(overall_outcome))
treatment_estimate <- reg1_rsr[[2,1]]
treatment_estimate_test <- reg1_rsr[[2,1]]*100
treatment_effect <- raw_control+treatment_estimate
treatment_se <- reg1_rsr[[2,2]]*100
treatment_p <- reg1_rsr[[2,4]]
treatment_estimate_upper <- (1.96*treatment_se)
treatment_estimate_lower <- (1.96*treatment_se)

control <- round(raw_control[[1]]*100, digits = 1)
treatment <- round(treatment_effect[[1]]*100, digits = 1)

jpeg("/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data]
POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-
Output/Plots/plot_reg_1.png",
```

```

quality = 75, width = 650, height = 700, units = "px", fontsize = 16)
BIT_barplot_adjusted(
  main = "Attendance Rate (Full Sample)",
  col.main = BITBlack,
  y = c(control, treatment),          ## bar heights
  barXLabels = c("Control","Treatment"),  ## bar labels
  CMin=c(control,treatment-treatment_estimate_lower),  ## lower CI limit of mean - 1.96 SDs
  CMax=c(control,treatment+treatment_estimate_upper),  ## upper CI limit of mean + 1.96 SDs
  ylab="Attendance Rate (%)",        ## Y axis label
  yline = 1,                        ## move the label out by 1 line so it doesn't overlap
  extramar = 1,
  barCol = "#C6D3DF",
  p=c(1,treatment_p),              ## p-values
  analysisType = "primary",
  N = 8922,
  subtitle = "*** p<0.01, * p<0.05, + p<0.1",
  line.main = 1
)
dev.off()

# Reg 2 (PP subgroup) -----

data_analysis_pp <- data_analysis %>%
  filter(Whether_PP == "Y")

table1(~overall_outcome | rct_assignment, data_analysis_pp)

treatment_outcomes_pp <- data_analysis_pp %>% filter(rct_assignment == "Treatment") %>%
  select(overall_outcome)
CI(treatment_outcomes_pp$overall_outcome, ci = 0.95)

control_outcomes_pp <- data_analysis_pp %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes_pp$overall_outcome, ci = 0.95)

reg2 <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender + Tutor_experience
+ tp_batch, data_analysis_pp)
summary(reg2)

```

```
### RSE
```

```
reg2_rsr <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + Tutor_experience + tp_batch',
                             data = data_analysis_pp, cluster = data_analysis_pp$BIT_Tutor_ID)
```

```
# Reg 2 Plot -----
```

```
raw_control_pp <- data_analysis_pp %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw
= mean(overall_outcome))
```

```
treatment_estimate_pp <- reg2_rsr[[2,1]]
```

```
treatment_effect_pp <- raw_control_pp + treatment_estimate_pp
```

```
treatment_se_pp <- reg2_rsr[[2,2]]
```

```
treatment_p_pp <- reg2_rsr[[2,4]]
```

```
treatment_estimate_upper_pp <- (1.96*treatment_se_pp)*100
```

```
treatment_estimate_lower_pp <- (1.96*treatment_se_pp)*100
```

```
control_pp <- round(raw_control_pp[[1]]*100, digits = 1)
```

```
treatment_pp <- round(treatment_effect_pp[[1]]*100, digits = 1)
```

```
jpeg("/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlVn72FMy_vcS8m5vAG9/[Project data]
POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-
Output/Plots/plot_reg_2.png",
```

```
    quality = 75, width = 650, height = 700, units = "px", pointsize = 16)
```

```
BIT_barplot_adjusted(
```

```
  main = "Attendance Rate (PP Sample)",
```

```
  col.main = BITBlack,
```

```
  y = c(control_pp, treatment_pp),          ## bar heights
```

```
  barXLabels = c("Control","Treatment"),    ## bar labels
```

```
  CMin=c(control_pp,treatment_pp-treatment_estimate_lower_pp),    ## lower CI limit of mean - 1.96 SDs
```

```
  CMax=c(control_pp,treatment_pp+treatment_estimate_upper_pp),    ## upper CI limit of mean + 1.96 SDs
```

```
  ylab="Attendance Rate (%)",              ## Y axis label
```

```
  yline = 1,                             ## move the label out by 1 line so it doesn't overlap
```

```
  extramar = 1,
```

```
  barCol = "#C6D3DF",
```

```
  N = 4040,
```

```
  analysisType = "secondary",
```

```
  p=c(1,treatment_p_pp),                  ## p-values
```

```
  subtitle = "** p<0.01, * p<0.05, + p<0.1",
```

```
  line.main = 1
```

```
)  
dev.off()
```

```
# Reg 1 & 2 Output -----
```

```
stargazer::stargazer(reg1, reg2, type = "html", title = "Exploratory Regression Analysis", out =  
"/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2  
POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-Output/regression_out_norsr.html",  
no.space = TRUE) ### with N
```

```
stargazer::stargazer(reg1_rsr, reg2_rsr, type = "html", title = "Exploratory Regression Analysis", out =  
"/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2  
POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-Output/regression_out.html",  
no.space = TRUE) ### with N
```

```
# Regression (outcome version 2) -----
```

```
data_analysis_2 <- data_analysis %>%
```

```
  filter(!is.na(overall_outcome_2)) ### we filter the data down to only those who should be include in this version of  
the outcome
```

```
### Regression 1
```

```
table1(~overall_outcome_2 | rct_assignment, data_analysis_2)
```

```
reg1_5 <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
Tutor_experience + tp_name * batch_number, data_analysis_2)
```

```
summary(reg1_5)
```

```
### RSE
```

```
regreg1_5_rse <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + tp_name * batch_number',  
data = data_analysis_2, cluster = data_analysis_2$BIT_Tutor_ID)
```

```
BITplot(reg1_5)
```

```
### Regression 2
```

```
data_analysis_pp_2 <- data_analysis_2 %>%
```

```
  filter(Whether_PP == "Y")
```

```
table1(~overall_outcome_2 | rct_assignment, data_analysis_pp_2)
```

```
reg2_5 <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
Tutor_experience + tp_name * batch_number, data_analysis_pp_2)
summary(reg2_5)

regreg2_5_rse <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject
+ Tutor_gender + Tutor_experience + tp_name * batch_number',
                                data = data_analysis_pp_2, cluster = data_analysis_pp_2$BIT_Tutor_ID)

BITplot(reg2_5)

# Outcome 1 by tutor provider -----

## view all FOUR tables in the viewer
provider <- c("The Tutor Trust", "TUTE", "Mannings", "School Partnership Tutors")

for (i in 1:length(provider)) {
  TEMP_temp <- data_analysis %>%
    filter(tp_name == provider[[i]])
  print(TEMP_temp)
  print(table1(~overall_outcome|rct_assignment, TEMP_temp, rowlabelhead = provider[[i]]))
}

# Regression 1 by tp provider outcome1 -----
data_analysis <- data_analysis %>% mutate(tutoring_experience = factor(case_when(Tutor_experience == "Less
than 6 months" ~ "Less than a year",
  Tutor_experience == "Less than 12 months" ~ "Less than a year",
  Tutor_experience == "1 - 2 Years" ~ "More than a year",
  Tutor_experience == "3 - 4 Years" ~ "More than a year",
  Tutor_experience == "5 - 10 Years" ~ "More than a year",
  Tutor_experience == "11 - 15 Years" ~ "More than a year",
  Tutor_experience == "16 - 20 Years" ~ "More than a year",
  Tutor_experience == "21 - 25 Years" ~ "More than a year",
  Tutor_experience == "26 - 30 Years" ~ "More than a year",
  Tutor_experience == "31 - 35 Years" ~ "More than a year",
  Tutor_experience == "36 - 40 Years" ~ "More than a year",
  Tutor_experience == "More than 40 Years" ~ "More than a year",
  Tutor_experience == "No previous tutoring experience" ~ "Less than a year",
  Tutor_experience == "Other" ~ "Other",
  Tutor_experience == "Missing" ~ "Other")))
```

```

table1(~tutoring_experience, data_analysis)

# The Tutor Trust Reg1 -----

data_reg1_tt <- data_analysis %>%
  filter(tp_name == "The Tutor Trust")

table1(~overall_outcome | rct_assignment, data_reg1_tt[!duplicated(BIT_Tutor_ID)])

table1(~overall_outcome | rct_assignment, data_reg1_tt)

data_reg1_tt$rct_assignment <- fct_rev(data_reg1_tt$rct_assignment)
hedges_g(overall_outcome ~ rct_assignment, data = data_reg1_tt, ci = 0.95)
data_reg1_tt$rct_assignment <- fct_rev(data_reg1_tt$rct_assignment)

treatment_outcomes <- data_reg1_tt %>% filter(rct_assignment == "Treatment") %>% select(overall_outcome)
CI(treatment_outcomes$overall_outcome, ci = 0.95)

control_outcomes <- data_reg1_tt %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes$overall_outcome, ci = 0.95)

reg1_tt <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
tutoring_experience + batch_number, data_reg1_tt)
summary(reg1_tt)

####RSE
reg1_tt_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + tutoring_experience + batch_number',
  data = data_reg1_tt, cluster = data_reg1_tt$BIT_Tutor_ID)

BITplot(reg1_tt)

raw_control <- data_reg1_tt %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw =
mean(overall_outcome))
treatment_estimate <- reg1_tt_rse[[2,1]]
treatment_effect <- raw_control+treatment_estimate
treatment_se <- reg1_tt_rse[[2,2]]*100

treatment_p <- reg1_tt_rse[[2,4]]

```

```

treatment_estimate_upper <- (1.96*treatment_se)
treatment_estimate_lower <- (1.96*treatment_se)

control <- round(raw_control[[1]]*100, digits = 1)
treatment <- round(treatment_effect[[1]]*100, digits = 1)

# jpeg("/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data]
# POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-Output/Plots/plot_TT.png",
#   quality = 75, width = 650, height = 700, units = "px", pointsize = 16)
BIT_barplot_adjusted(
  main = "The Tutor Trust",
  col.main = BITBlack,
  y = c(control, treatment),          ## bar heights
  barXLabels = c("Control", "Treatment"), ## bar labels
  CMin=c(control,treatment-treatment_estimate_lower), ## lower CI limit of mean - 1.96 SDs
  CMax=c(control,treatment+treatment_estimate_upper), ## upper CI limit of mean + 1.96 SDs
  ylab="Attendance Rate (%)",        ## Y axis label
  yline = 1,                        ## move the label out by 1 line so it doesn't overlap
  extramar = 1,
  barCol = "#C6D3DF",
  p=c(1,treatment_p),              ## p-values
  analysisType = "exploratory",
  N = 2277,
  subtitle = "** p<0.01, * p<0.05, + p<0.1",
  line.main = 1
)
# dev.off()

# TUTE reg1 -----

data_reg1_tute <- data_analysis %>%
  filter(tp_name == "TUTE")

table1(~overall_outcome | rct_assignment, data_reg1_tute[!duplicated(BIT_Tutor_ID)])

```

```
table1(~overall_outcome | rct_assignment, data_reg1_tute)

data_reg1_tute$rct_assignment <- fct_rev(data_reg1_tute$rct_assignment)
hedges_g(overall_outcome ~ rct_assignment, data = data_reg1_tute, ci = 0.95)
data_reg1_tute$rct_assignment <- fct_rev(data_reg1_tute$rct_assignment)

treatment_outcomes <- data_reg1_tute %>% filter(rct_assignment == "Treatment") %>% select(overall_outcome)
CI(treatment_outcomes$overall_outcome, ci = 0.95)

control_outcomes <- data_reg1_tute %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes$overall_outcome, ci = 0.95)

reg1_tute <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
tutoring_experience + batch_number, data_reg1_tute)
summary(reg1_tute)

#RSE
reg1_tute_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + tutoring_experience + batch_number',
                                data = data_reg1_tute, cluster = data_reg1_tute$BIT_Tutor_ID)

BITplot(reg1_tute)

raw_control <- data_reg1_tute %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw =
mean(overall_outcome))
treatment_estimate <- reg1_tute_rse[[2,1]]
treatment_effect <- raw_control+treatment_estimate
treatment_se <- reg1_tute_rse[[2,2]]*100

treatment_p <- reg1_tute_rse[[2,4]]
treatment_estimate_upper <- (1.96*treatment_se)
treatment_estimate_lower <- (1.96*treatment_se)

control <- round(raw_control[[1]]*100, digits = 1)
treatment <- round(treatment_effect[[1]]*100, digits = 1)

jpeg("/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlVn72FMy_vcS8m5vAG9/[Project data]
POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-
Output/Plots/plot_reg_Tute.png",
     quality = 75, width = 650, height = 700, units = "px", pointsize = 16)
```

```

BIT_barplot_adjusted(
  main = "Tute",
  col.main = BITBlack,
  y = c(control, treatment),          ## bar heights
  barXLabels = c("Control","Treatment"),  ## bar labels
  CIMin=c(control,treatment-treatment_estimate_lower),  ## lower CI limit of mean - 1.96 SDs
  CIMax=c(control,treatment+treatment_estimate_upper),  ## upper CI limit of mean + 1.96 SDs
  ylab="Attendance Rate (%)",      ## Y axis label
  yline = 1,          ## move the label out by 1 line so it doesn't overlap
  extramar = 1,
  barCol = "#C6D3DF",
  p=c(1,treatment_p),      ## p-values
  analysisType = "exploratory",
  N = 1077,
  subtitle = "** p<0.01, * p<0.05, + p<0.1",
  line.main = 1
)
dev.off()

```

# Reg1 Mannings -----

### Mannings

```

data_reg1_mannings <- data_analysis %>%
  filter(tp_name == "Mannings")

```

```
table1(~overall_outcome | rct_assignment, data_reg1_mannings)
```

```
table1(~overall_outcome | rct_assignment, data_reg1_mannings[!duplicated(BIT_Tutor_ID)])
```

```
table1(~overall_outcome | rct_assignment, data_reg1_mannings)
```

```

data_reg1_mannings$rct_assignment <- fct_rev(data_reg1_mannings$rct_assignment)
hedges_g(overall_outcome ~ rct_assignment, data = data_reg1_mannings, ci = 0.95)
data_reg1_mannings$rct_assignment <- fct_rev(data_reg1_mannings$rct_assignment)

```

```
treatment_outcomes <- data_reg1_mannings %>% filter(rct_assignment == "Treatment") %>%
select(overall_outcome)

CI(treatment_outcomes$overall_outcome, ci = 0.95)

control_outcomes <- data_reg1_mannings %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes$overall_outcome, ci = 0.95)

reg1_manning <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
tutoring_experience + batch_number, data_reg1_mannings)

summary(reg1_manning)

#RSE
reg1_manning_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group +
Main_subject + Tutor_gender + tutoring_experience + batch_number',
data = data_reg1_mannings, cluster = data_reg1_mannings$BIT_Tutor_ID)

BITplot(reg1_manning)

raw_control <- data_reg1_mannings %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw
= mean(overall_outcome))

treatment_estimate <- reg1_manning_rse[[2,1]]
treatment_effect <- raw_control+treatment_estimate
treatment_se <- reg1_manning_rse[[2,2]]*100
treatment_p <- reg1_manning_rse[[2,4]]
treatment_estimate_upper <- (1.96*treatment_se)
treatment_estimate_lower <- (1.96*treatment_se)

control <- round(raw_control[[1]]*100, digits = 1)
treatment <- round(treatment_effect[[1]]*100, digits = 1)

BIT_barplot_adjusted(
  main = "Manning's Tutors",
  col.main = BITBlack,
  y = c(control, treatment), ## bar heights
  barXLabels = c("Control","Treatment"), ## bar labels
  CMin=c(control,treatment-treatment_estimate_lower), ## lower CI limit of mean - 1.96 SDs
  CMax=c(control,treatment+treatment_estimate_upper), ## upper CI limit of mean + 1.96 SDs
  ylab="Attendance Rate (%)", ## Y axis label
```

```
ylab = 1,          ## move the label out by 1 line so it doesn't overlap
extramar = 1,
barCol = "#C6D3DF",
p=c(1,treatment_p),    ## p-values
analysisType = "exploratory",
N = 2843,
subtitle = "*** p<0.01, * p<0.05, + p<0.1",
line.main = 1
)
```

```
# Reg1 School Partnership Tutors -----
```

```
data_reg1_spt <- data_analysis %>%
  filter(tp_name == "School Partnership Tutors")
```

```
table1(~overall_outcome | rct_assignment, data_reg1_spt[!duplicated(BIT_Tutor_ID)])
```

```
table1(~overall_outcome | rct_assignment, data_reg1_spt)
```

```
data_reg1_spt$rct_assignment <- fct_rev(data_reg1_spt$rct_assignment)
hedges_g(overall_outcome ~ rct_assignment, data = data_reg1_spt, ci = 0.95)
data_reg1_spt$rct_assignment <- fct_rev(data_reg1_spt$rct_assignment)
```

```
treatment_outcomes <- data_reg1_spt %>% filter(rct_assignment == "Treatment") %>% select(overall_outcome)
CI(treatment_outcomes$overall_outcome, ci = 0.95)
```

```
control_outcomes <- data_reg1_spt %>% filter(rct_assignment == "Control") %>% select(overall_outcome)
CI(control_outcomes$overall_outcome, ci = 0.95)
```

```
reg1_spt <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
  tutoring_experience + batch_number, data_reg1_spt)
summary(reg1_spt)
```

```
#RSE
```

```
reg1_spt_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
  Tutor_gender + tutoring_experience + batch_number',
```

```
data = data_reg1_spt, cluster = data_reg1_spt$BIT_Tutor_ID)
```

```
BITplot(reg1_spt)
```

```
raw_control <- data_reg1_spt %>% filter(rct_assignment == "Control") %>% dplyr::summarise(control_raw =  
mean(overall_outcome))
```

```
treatment_estimate <- reg1_spt_rse[[2,1]]
```

```
treatment_effect <- raw_control+treatment_estimate
```

```
treatment_se <- reg1_spt_rse[[2,2]]*100
```

```
treatment_p <- reg1_spt_rse[[2,4]]
```

```
treatment_estimate_upper <- (1.96*treatment_se)
```

```
treatment_estimate_lower <- (1.96*treatment_se)
```

```
control <- round(raw_control[[1]]*100, digits = 1)
```

```
treatment <- round(treatment_effect[[1]]*100, digits = 1)
```

```
BIT_barplot_adjusted(  
  main = "School Partnership Tutors",  
  col.main = BITBlack,  
  y = c(control, treatment),          ## bar heights  
  barXLabels = c("Control","Treatment"), ## bar labels  
  CMin=c(control,treatment-treatment_estimate_lower), ## lower CI limit of mean - 1.96 SDs  
  CMax=c(control,treatment+treatment_estimate_upper), ## upper CI limit of mean + 1.96 SDs  
  ylab="Attendance Rate (%)",      ## Y axis label  
  yline = 1,                      ## move the label out by 1 line so it doesn't overlap  
  extramar = 1,  
  barCol = "#C6D3DF",  
  p=c(1,treatment_p),             ## p-values  
  analysisType = "exploratory",  
  N = 2725,  
  subtitle = "** p<0.01, * p<0.05, + p<0.1",  
  line.main = 1  
)
```

```
# TP Reg Outputs -----
```

```
## Out the regression
```

```
stargazer::stargazer(reg1_tt, reg1_tute, reg1_manning, reg1_spt, type = "html", title = "Exploratory Regression  
Analysis", out = "/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/regression_TP_norsr.html", no.space = TRUE) ### with N
```

```
stargazer::stargazer(reg1_tt_rse, reg1_tute_rse, reg1_manning_rse, reg1_spt_rse, type = "html", title =  
"Exploratory Regression Analysis", out = "/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/regression_TP_rse.html", no.space = TRUE) ###
```

```
# Regression 1 by tp provider outcome2-----
```

```
### The tutor trust
```

```
data_reg1_tt_2 <- data_analysis_2 %>%  
  filter(tp_name == "The Tutor Trust")
```

```
table1(~overall_outcome_2 | rct_assignment, data_reg1_tt_2)
```

```
reg1_tt <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
Tutor_experience + batch_number, data_reg1_tt_2)
```

```
summary(reg1_tt)
```

```
#RSE
```

```
reg1_tt_rse_2 <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject  
+ Tutor_gender + Tutor_experience + batch_number',
```

```
data = data_reg1_tt_2, cluster = data_reg1_tt_2$BIT_Tutor_ID)
```

```
BITplot(reg1_tt)
```

```
### TUTE
```

```
data_reg1_tute_2 <- data_analysis_2 %>%  
  filter(tp_name == "TUTE")
```

```
table1(~overall_outcome_2 | rct_assignment, data_reg1_tute_2)
```

```
reg1_tute <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
Tutor_experience + batch_number, data_reg1_tute_2)  
summary(reg1_tute)
```

```
#RSE
```

```
reg1_tute_rse_2 <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + batch_number',  
data = data_reg1_tute_2, cluster = data_reg1_tute_2$BIT_Tutor_ID)
```

```
BITplot(reg1_tute)
```

```
### Mannings
```

```
data_reg1_mannings_2 <- data_analysis_2 %>%  
filter(tp_name == "Mannings")
```

```
table1(~overall_outcome_2 | rct_assignment, data_reg1_mannings_2)
```

```
reg1_manning <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
Tutor_experience + batch_number, data_reg1_mannings_2)  
summary(reg1_manning)
```

```
##RSE
```

```
reg1_manning_rse_2 <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + batch_number',  
data = data_reg1_mannings_2, cluster = data_reg1_mannings_2$BIT_Tutor_ID)
```

```
BITplot(reg1_manning)
```

```
### School Partnership Tutors
```

```
data_reg1_spt_2 <- data_analysis %>%  
filter(tp_name == "School Partnership Tutors")
```

```
table1(~overall_outcome_2 | rct_assignment, data_reg1_spt_2)
```

```
reg1_spt <- lm(overall_outcome_2 ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
Tutor_experience + batch_number, data_reg1_spt_2)  
summary(reg1_spt)
```

```
#RSE
```

```
reg1_manning_rse_2 <- TREX::lm_cluster(formula = 'overall_outcome_2 ~ rct_assignment + Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + batch_number',  
data = data_reg1_spt_2, cluster = data_reg1_spt_2$BIT_Tutor_ID)
```

```
BITplot(reg1_spt)
```

```
# Hedges g -----
```

```
data_analysis$rct_assignment <- fct_rev(data_analysis$rct_assignment)  
data_analysis_pp$rct_assignment <- fct_rev(data_analysis_pp$rct_assignment)
```

```
hedges_g(overall_outcome ~ rct_assignment, data = data_analysis, ci = 0.95)  
hedges_g(overall_outcome ~ rct_assignment, data = data_analysis_pp, ci = 0.95)
```

```
data_analysis$rct_assignment <- fct_rev(data_analysis$rct_assignment)  
data_analysis_pp$rct_assignment <- fct_rev(data_analysis_pp$rct_assignment)
```

```
# hedg_g(data_analysis, overall_outcome_2 ~ rct_assignment)  
# hedg_g(data_analysis_pp, overall_outcome_2 ~ rct_assignment)
```

```
reg1 <- lm(overall_outcome ~ rct_assignment * tp_name + Year_Group, data_analysis)  
summary(reg1)
```

```
# reg1 <- lm(overall_outcome_2 ~ rct_assignment * tp_name + Year_Group, data_analysis_2)  
# summary(reg1)
```

```
reg1 <- lmer(overall_outcome ~ 1 + rct_assignment + (1 |BIT_Tutor_ID), data_analysis)  
summary(reg1)  
anova(reg1)
```

### Yihan and I explore using a random effect model interaction model most of the effect was driven by spt provider and this seemed to be confirmed when we random

```
## clustered standard errors
```

```
## if we dont run the random effect we need to account for the nested structute of the regessopm
```

```
# CACE analysis -----
```

```
tutor_compliance <- 0.675
```

```
treatment_estimate*100 / tutor_compliance
```

```
(treatment_estimate*100 + treatment_se) / tutor_compliance
```

```
(treatment_estimate*100 - treatment_se) / tutor_compliance
```

```
# 1 & 2 experience - Cleaning -----
```

```
table1(~Tutor_experience, data_analysis)
```

```
data_analysis_experience <- data_analysis %>%
```

```
  mutate(binary_experience = factor(case_when(Tutor_experience == "Less than 6 months" ~ 1,
    Tutor_experience == "Less than 12 months" ~ 1,
    Tutor_experience == "1 - 2 Years" ~ 3,
    Tutor_experience == "3 - 4 Years" ~ 2,
    Tutor_experience == "5 - 10 Years" ~ 2,
    Tutor_experience == "11 - 15 Years" ~ 2,
    Tutor_experience == "16 - 20 Years" ~ 2,
    Tutor_experience == "21 - 25 Years" ~ 2,
    Tutor_experience == "26 - 30 Years" ~ 2,
    Tutor_experience == "31 - 35 Years" ~ 2,
    Tutor_experience == "36 - 40 Years" ~ 2,
    Tutor_experience == "More than 40 Years" ~ 2,
    Tutor_experience == "No previous tutoring experience" ~ 1,
    Tutor_experience == "Other" ~ 0,
    Tutor_experience == "Missing" ~ 0)))
```

```
table1(~binary_experience, data_analysis_experience)
```

```
# 1 experience - Tutor Experience Exploratory (Cut at 1 years) -----
```

```
data_export_experience_less_1 <- data_analysis_experience %>%  
  filter(binary_experience == 1)
```

```
data_export_experience_more_1 <- data_analysis_experience %>%  
  filter(binary_experience == 2 | binary_experience == 3)
```

```
# 1A - less than 1 year of experience -----
```

```
table1(~overall_outcome | rct_assignment, data_export_experience_less_1)
```

```
reg1_less <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender + batch_number,  
data_export_experience_less_1)  
summary(reg1_less)
```

```
#RSE
```

```
reg1_less_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
Tutor_gender + batch_number',  
data = data_export_experience_less_1, cluster =  
data_export_experience_less_1$BIT_Tutor_ID)
```

```
BITplot(reg1_less)
```

```
# 1A experience - less than 1 year bar plot -----
```

```
experience_less_1_control <- data_export_experience_less_1 %>% filter(rct_assignment == "Control") %>%  
dplyr::summarise(mean = mean(overall_outcome)) %>% .[[1,1]] %>% round(., digits = 4)*100
```

```
experience_less_1_treatment <- round(experience_less_1_control + reg1_less_rse[[2,1]]*100, digits = 2)
```

```
experience_less_1_treatment_higher <- experience_less_1_treatment + (1.96*reg1_less_rse[[2,2]]*100)
```

```
experience_less_1_treatment_lower <- experience_less_1_treatment - (1.96*reg1_less_rse[[2,2]]*100)
```

```
experience_pvalue_less_1 <- reg1_less_rse[[2,4]]
```

```
BITBarplot(
```

```

y = c(experience_less_1_control, experience_less_1_treatment),          ## bar heights
barXLabels = c("Control","Treatment"),          ## bar labels
CImin=c(experience_less_1_control,experience_less_1_treatment_lower),    ## lower CI limit of mean - 1.96
SDs
CIMax=c(experience_less_1_control,experience_less_1_treatment_higher),    ## upper CI limit of mean +
1.96 SDs
ylab="Attendance Rate (%)",          ## Y axis label
yline = 1,          ## move the label out by 1 line so it doesn't overlap
extramar = 1,
p=c(1,experience_pvalue_less_1),          ## p-values
N = 1647,
subtitle = "*** p<0.01, * p<0.05, + p<0.1"
)

```

# 1B - more than 1 year of experience -----

```
table1(~overall_outcome | rct_assignment, data_export_experience_more_1)
```

```
reg1_more <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
batch_number, data_export_experience_more_1)
```

```
summary(reg1_more)
```

#RSE

```
reg1_more_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject
+ Tutor_gender + batch_number',
```

```

data = data_export_experience_more_1, cluster =
data_export_experience_more_1$BIT_Tutor_ID)

```

```
BITplot(reg1_more)
```

# 1A experience - more than 1 year bar plot -----

```
experience_more_1_control <- data_export_experience_more_1 %>% filter(rct_assignment == "Control") %>%
dplyr::summarise(mean = mean(overall_outcome)) %>% .[[1,1]] %>% round(., digits = 4)*100
```

```
experience_more_1_treatment <- round(experience_more_1_control + reg1_more_rse[[2,1]]*100, digits = 2)
```

```
experience_more_1_treatment_higher <- experience_more_1_treatment + (1.96*reg1_more_rse[[2,2]]*100)
```

```
experience_more_1_treatment_lower <- experience_more_1_treatment - (1.96*reg1_more_rse[[2,2]]*100)
```

```
experience_pvalue_more_1 <- reg1_more_rse[[2,4]]
```

```
BITBarplot(
```

```

y = c(experience_more_1_control, experience_more_1_treatment),          ## bar heights
barXLabels = c("Control","Treatment"),          ## bar labels
CMin=c(experience_more_1_control,experience_more_1_treatment_lower),    ## lower CI limit of mean -
1.96 SDs
CMax=c(experience_more_1_control,experience_more_1_treatment_higher),    ## upper CI limit of mean
+ 1.96 SDs
ylab="Attendance Rate (%)",          ## Y axis label
yline = 1,          ## move the label out by 1 line so it doesn't overlap
extramar = 1,
p=c(1,experience_pvalue_more_1),          ## p-values
N = 6614,
subtitle = "*** p<0.01, * p<0.05, + p<0.1"
)

```

# 1 experience - Regression output -----

```

stargazer::stargazer(reg1_less, reg1_more, type = "html", title = "Exploratory Regression Analysis", out =
"/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2
POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-
Output/regression_1_years_norse.html", no.space = TRUE) #### with N

```

```

stargazer::stargazer(reg1_less_rse, reg1_more_rse, type = "html", title = "Exploratory Regression Analysis", out =
"/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2
POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-
Output/regression_1_years_rse.html", no.space = TRUE) #### with N

```

# 2 experience - Tutor Experience Exploratory (Cut at 2 years) -----

```

data_analysis_experience_less_2 <- data_analysis_experience %>%
  filter(binary_experience == 1 | binary_experience == 3)

```

```

data_analysis_experience_more_2 <- data_analysis_experience %>%
  filter(binary_experience == 2)

```

# 2A experience - Less than 2 years experience regression -----

```

table1(~overall_outcome | rct_assignment, data_analysis_experience_less_2)

```

```

reg1_2_less <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
batch_number, data_analysis_experience_less_2)

summary(reg1_2_less)

#RSE
reg1_2_less_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject
+ Tutor_gender + batch_number',
                                data = data_analysis_experience_less_2, cluster =
data_analysis_experience_less_2$BIT_Tutor_ID)

BITplot(reg1_2_less)

# 2A expereince - Less than 2 years bar Plot -----

experience_less_2_control <- data_analysis_experience_less_2 %>% filter(rct_assignment == "Control") %>%
dplyr::summarise(mean = mean(overall_outcome)) %>% .[[1,1]] %>% round(., digits = 4)*100

expeience_less_2_treatment <- round(experience_less_2_control + reg1_2_less_rse[[2,1]]*100, digits = 2)

experience_less_2_treatment_higher <- expeience_less_2_treatment + (1.96*reg1_2_less_rse[[2,2]]*100)
experience_less_2_treatment_lower <- expeience_less_2_treatment - (1.96*reg1_2_less_rse[[2,2]]*100)
expeience_pvalue <- reg1_2_less_rse[[2,4]]

BITBarplot(
  y = c(experience_less_2_control, expeience_less_2_treatment),          ## bar heights
  barXLabels = c("Control","Treatment"),          ## bar labels
  CIMin=c(experience_less_2_control,expeience_less_2_treatment_lower),    ## lower CI limit of mean - 1.96
SDs
  CIMax=c(experience_less_2_control,expeience_less_2_treatment_higher),    ## upper CI limit of mean +
1.96 SDs
  ylab="Attendance Rate (%)",      ## Y axis label
  yline = 1,          ## move the label out by 1 line so it doesn't overlap
  extramar = 1,
  p=c(1,expeience_pvalue),      ## p-values
  N = 4502,
  subtitle = "*** p<0.01, * p<0.05, + p<0.1"
)

```

# 2B expereince - More than 2 years experience regression -----

```
table1(~overall_outcome | rct_assignment, data_analysis_experience_more_2)
```

```
reg1_2_more <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
batch_number, data_analysis_experience_more_2)
```

```
summary(reg1_2_less)
```

#RSE

```
reg1_2_more_rse <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group +  
Main_subject + Tutor_gender + batch_number',
```

```
data = data_analysis_experience_more_2, cluster =  
data_analysis_experience_more_2$BIT_Tutor_ID)
```

```
BITplot(reg1_2_more)
```

# 2B expereince - More than 2 years bar Plot -----

```
experience_more_2_control <- data_analysis_experience_more_2 %>% filter(rct_assignment == "Control") %>%  
dplyr::summarise(mean = mean(overall_outcome)) %>% .[[1,1]] %>% round(., digits = 4)*100
```

```
expereience_more_2_treatment <- round(experience_more_2_control + reg1_2_more_rse[[2,1]]*100, digits = 2)
```

```
expereience_more_2_treatment_higher <- expereience_more_2_treatment + (1.96*reg1_2_more_rse[[2,2]]*100)
```

```
expereience_more_2_treatment_lower <- expereience_more_2_treatment - (1.96*reg1_2_more_rse[[2,2]]*100)
```

```
expereience_pvalue_more <- reg1_2_more_rse[[2,4]]
```

```
BITBarplot(
```

```
y = c(experience_more_2_control, expereience_more_2_treatment), ## bar heights
```

```
barXLabels = c("Control","Treatment"), ## bar labels
```

```
CIMin=c(experience_more_2_control,expereience_more_2_treatment_lower), ## lower CI limit of mean -  
1.96 SDs
```

```
CIMax=c(experience_more_2_control,expereience_more_2_treatment_higher), ## upper CI limit of mean  
+ 1.96 SDs
```

```
ylab="Attendance Rate (%)", ## Y axis label
```

```
yline = 1, ## move the label out by 1 line so it doesn't overlap
```

```
extramar = 1,
```

```
p=c(1,expereience_pvalue_more), ## p-values
```

```
N = 3759,
```

```
subtitle = "*** p<0.01, * p<0.05, + p<0.1"
```

```
)
```

# 2 experience - Regression Outputs -----

```
stargazer::stargazer(reg1_2_less, reg1_2_more, type = "html", title = "Exploratory Regression Analysis", out =  
"/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2  
POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-  
Output/regression_2_years_norse.html", no.space = TRUE) ### with N
```

```
stargazer::stargazer(reg1_2_less_rse, reg1_2_more_rse, type = "html", title = "Exploratory Regression Analysis",  
out = "/Volumes/GoogleDrive/.shortcut-targets-by-id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data]  
POEE2 POEE3 National Tutoring Programme/RCT1 — Birds of a feather/Analysis/T3-  
Output/regression_2_years_rse.html", no.space = TRUE) ### with N
```

# Dotplot -----

```
dot_plot <- function(data, filter) {  
  outcome <- filter  
  exp_data <- function(outcome, regression_exp) {  
    upper <- function(effect, SE) {  
      effect + (1.96*SE)  
    }  
  
    lower <- function(effect, SE) {  
      effect - (1.96*SE)  
    }  
  
    outcome <- outcome  
    effect <- reg_exp[[2,1]]  
    SE <- reg_exp[[2,2]]  
    p_value <- reg_exp[[2,4]]  
  
    effect <- effect  
    upper_effect <- upper(effect, SE)  
    lower_effect <- lower(effect, SE)  
  
    outputs <- tibble::tibble(outcome = outcome,  
                             effect = effect,
```

```

        upper = upper_effect,
        lower = lower_effect,
        p_value = p_value)
    return(outputs)
}

data_exp <- data %>% filter(experience_dotplot == filter)

reg_exp <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + tp_name + batch_number',
                           data = data_exp, cluster = data_exp$BIT_Tutor_ID)

outputs <- exp_data(outcome = outcome, regression_exp = reg_exp)

return(outputs)
}

# categories <- c("No previous tutoring experience", "Less than 6 months", "Less than 12 months", "1 - 2 Years",
#               "3 - 4 Years", "5 - 10 Years", "11 - 15 Years", "16 - 20 Years",
#               "21 - 25 Years", "26 - 30 Years", "31 - 35 Years", "36 - 40 Years",
#               "More than 40 Years", "Other", "Missing")

data_dotplot <- data_analysis %>%
  mutate(Tutor_experience = as.character(Tutor_experience)) %>%
  mutate(experience_dotplot = case_when(
    Tutor_experience == "Less than 6 months" ~ "Less than 1 Year",
    Tutor_experience == "Less than 12 months" ~ "Less than 1 Year",
    Tutor_experience == "1 - 2 Years" ~ Tutor_experience,
    Tutor_experience == "3 - 4 Years" ~ Tutor_experience,
    Tutor_experience == "5 - 10 Years" ~ Tutor_experience,
    Tutor_experience == "11 - 15 Years" ~ "More than 10 Years",
    Tutor_experience == "16 - 20 Years" ~ "More than 10 Years",
    Tutor_experience == "21 - 25 Years" ~ "More than 10 Years",
    Tutor_experience == "26 - 30 Years" ~ "More than 10 Years",
    Tutor_experience == "31 - 35 Years" ~ "More than 10 Years",
    Tutor_experience == "36 - 40 Years" ~ "More than 10 Years",

```

```
Tutor_experience == "More than 40 Years" ~ "More than 10 Years",  
Tutor_experience == "No previous tutoring experience" ~ "Less than 1 Year",  
Tutor_experience == "Other" ~ "Other",  
Tutor_experience == "Missing" ~ "Other"))
```

```
categories <- c("Less than 1 Year", "1 - 2 Years", "3 - 4 Years", "5 - 10 Years", "More than 10 Years", "Other")
```

```
full_output <- tibble()  
for (i in 1:length(categories)) {  
  values <- dot_plot(data_dotplot, categories[[i]])  
  full_output <- rbind(full_output, values)  
  full_output  
}
```

```
full_output$outcome <- factor(full_output$outcome, levels = categories)
```

```
full_output <- full_output %>% mutate(effect = effect*100,  
  upper = upper*100,  
  lower = lower*100)
```

```
label.df <- data.frame(Group = c("Less than 1 Year", "1 - 2 Years", "3 - 4 Years", "5 - 10 Years", "More than 10  
Years", "Other"), Value = full_output$effect) %>%  
  filter(Group == "Less than 1 Year")
```

```
full_output %>% ggplot() +  
  geom_point(mapping = aes(outcome, upper), stat = "identity", size = 3, color = "#4d4f52") +  
  geom_point(mapping = aes(outcome, lower), stat = "identity", size = 3, color = "#4d4f52") +  
  geom_hline(yintercept = 0) +  
  theme_bw() + theme(panel.border = element_blank(), panel.grid.major = element_blank(),  
    panel.grid.minor = element_blank(), axis.line = element_line(colour = "black"),  
    legend.position="none",  
    axis.title.x = element_blank(), axis.ticks.y = element_blank(), axis.line.y = element_blank(), axis.text  
= element_text(size = 12), axis.text.y=element_text(colour="black"), axis.text.x =element_text(colour="black"),  
axis.title.y = element_text(colour = "black", size = 14)) +  
  geom_segment(aes(x = full_output[[1,1]], xend = full_output[[1,1]], yend = full_output[[1,3]], y = full_output[[1,4]],  
    linetype = "dashed", col = "#4d4f52") +
```

```

geom_segment(aes(x = full_output[[2,1]], xend = full_output[[2,1]], yend = full_output[[2,3]], y = full_output[[2,4]]),
linetype = "dashed", col = "#4d4f52") +

geom_segment(aes(x = full_output[[3,1]], xend = full_output[[3,1]], yend = full_output[[3,3]], y = full_output[[3,4]]),
linetype = "dashed", col = "#4d4f52") +

geom_segment(aes(x = full_output[[4,1]], xend = full_output[[4,1]], yend = full_output[[4,3]], y = full_output[[4,4]]),
linetype = "dashed", col = "#4d4f52") +

geom_segment(aes(x = full_output[[5,1]], xend = full_output[[5,1]], yend = full_output[[5,3]], y = full_output[[5,4]]),
linetype = "dashed", col = "#4d4f52") +

geom_segment(aes(x = full_output[[6,1]], xend = full_output[[6,1]], yend = full_output[[6,3]], y = full_output[[6,4]]),
linetype = "dashed", col = "#4d4f52") +

ylab("Treatment Effect (percentage points)") +

geom_point(mapping = aes(x = factor(outcome, level = categories), effect), stat = "identity", size = 5, color =
"#4d4f52") +

geom_text(data = label.df, label = "*", aes(x = Group, y = Value), vjust = -0.5, hjust = -1, size = 6) +

labs(caption = "*** p<0.01, * p<0.05, + p<0.1") +

scale_x_discrete(labels=c("Less than 1 Year" = "Less than 1 Year\n(n = 1647)", "1 - 2 Years" = "1 - 2 Years\n(n
= 2855)", "3 - 4 Years" = "3 - 4 Years\n(n = 620)", "5 - 10 Years" = "5 - 10 Years\n(n = 890)",
"More than 10 Years" = "More than 10 Years\n(n = 2249)", "Other" = "Other\n(n = 661)"))

```

```
table1(~experience_dotplot, data_dotplot)
```

```
# Experience regressions -----
```

```
table1(~experience_dotplot, data_dotplot)
```

```
exp_1 <- data_dotplot %>%
```

```
  filter(experience_dotplot == "Less than 1 Year")
```

```
reg_exp_1 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +
Tutor_gender + tp_name + batch_number',
```

```
  data = exp_1, cluster = exp_1$BIT_Tutor_ID)
```

```
reg_exp_1_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +
batch_number, exp_1)
```

```
0.05 + (0.022*1.96)
```

```
0.05 - (0.022*1.96)
```

```
exp_2 <- data_dotplot %>%  
  filter(experience_dotplot == "1 - 2 Years")  
  
reg_exp_2 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
  Tutor_gender + tp_name + batch_number',  
  data = exp_2, cluster = exp_2$BIT_Tutor_ID)  
  
reg_exp_2_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
  batch_number, exp_2)  
  
exp_3 <- data_dotplot %>%  
  filter(experience_dotplot == "3 - 4 Years")  
  
reg_exp_3 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
  Tutor_gender + tp_name + batch_number',  
  data = exp_3, cluster = exp_3$BIT_Tutor_ID)  
  
reg_exp_3_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
  batch_number, exp_3)  
  
exp_4 <- data_dotplot %>%  
  filter(experience_dotplot == "5 - 10 Years")  
  
reg_exp_4 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
  Tutor_gender + tp_name + batch_number',  
  data = exp_4, cluster = exp_4$BIT_Tutor_ID)  
  
reg_exp_4_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
  batch_number, exp_4)  
  
exp_5 <- data_dotplot %>%  
  filter(experience_dotplot == "More than 10 Years")  
  
reg_exp_5 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
  Tutor_gender + tp_name + batch_number',  
  data = exp_5, cluster = exp_5$BIT_Tutor_ID)
```

```
reg_exp_5_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
batch_number, exp_5)
```

```
exp_6 <- data_dotplot %>%  
  filter(experience_dotplot == "Other")
```

```
reg_exp_6 <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment + Year_Group + Main_subject +  
Tutor_gender + tp_name + batch_number',  
  data = exp_6, cluster = exp_6$BIT_Tutor_ID)
```

```
reg_exp_6_n <- lm(overall_outcome ~ rct_assignment + Year_Group + Main_subject + Tutor_gender +  
batch_number, exp_6)
```

```
stargazer::stargazer(reg_exp_1, reg_exp_2, reg_exp_3, reg_exp_4, reg_exp_5, reg_exp_6, type = "html", title =  
"Exploratory Regression Analysis", out = "/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/regression_experience_rse.html", no.space = TRUE) ### with N
```

```
stargazer::stargazer(reg_exp_1_n, reg_exp_2_n, reg_exp_3_n, reg_exp_4_n, reg_exp_5_n, reg_exp_6_n, type =  
"html", title = "Exploratory Regression Analysis", out = "/Volumes/GoogleDrive/.shortcut-targets-by-  
id/1ddRrD80jSE0DZlvN72FMy_vcS8m5vAG9/[Project data] POEE2 POEE3 National Tutoring Programme/RCT1  
— Birds of a feather/Analysis/T3-Output/regression_experience_norse.html", no.space = TRUE) ### with N
```

```
# Primary regression for school year -----
```

```
### Regression 1
```

```
table1(~Year_Group, data_analysis)
```

```
### Yihan taught version (this is the version I am going to stick with as it is from the TREX package)
```

```
reg1_year_group_rsr <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment*Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + tp_batch',  
  data = data_analysis, cluster = data_analysis$BIT_Tutor_ID)
```

```
# Primary regression tutoring provider -----
```

```
### Regression 1
```

```
table1(~tp_name, data_analysis)
```

```
### Yihan taught version (this is the version I am going to stick with as it is from the TREX package)
```

```
reg1_rp_rsr <- TREX::lm_cluster(formula = 'overall_outcome ~ rct_assignment*tp_name + Year_Group +  
Main_subject + Tutor_gender + Tutor_experience + tp_batch',  
                                data = data_analysis, cluster = data_analysis$BIT_Tutor_ID)
```

```
#When I do the full regression with the assignment*tp provider interaction with control and Manning as the reference  
categories, SPT interaction is sig at 0.05, Tutor trust in sig at 0.1 and TUTE is non sig.
```

```
# Dotplot for years of experience -----
```

```
categories <- c("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "MISSING")
```

```
# Extra sessions -----
```

```
test <- data_analysis %>%
```

```
  filter(rct_assignment == "Control") %>%
```

```
  mutate(attended = Online_attended_pupil_cleaned + F2F_attended_pupil_cleaned)
```

```
mean(test$attended, rm.na = T)
```

```
n_pupils_control <- 4510
```

```
sessions <- 8.8
```

```
effect_size <- 0.042
```

```
effect_size_upper <- 0.068
```

```
effect_size_lower <- 0.015
```

```
n_pupils_control*sessions*(1+effect_size)
```

```
(n_pupils_control*sessions*(1+effect_size))-(n_pupils_control*sessions)
```

```
(n_pupils_control*sessions*(1+effect_size_lower))-(n_pupils_control*sessions)
```

```
(n_pupils_control*sessions*(1+effect_size_upper))-(n_pupils_control*sessions)
```

```
250000*8.8*(1+effect_size)
```

```
n_pupils_control*sessions*(1+effect_size_upper)
```

```
n_pupils_control*sessions*(1+effect_size_lower)
```

```
(8.8*(1.041-1))*(n_pupils_control)
```

```
(8.8*(1.015-1))*(n_pupils_control)
```

```
(8.8*(1.068-1))*(n_pupils_control)
```

```
(8.8*(1.042-1))*(500000)
```

```
(8.8*(1.015-1))*(500000)
```

```
(8.8*(1.068-1))*(500000)
```

```
BIT_barplot_adjusted(
  main = "Attendance Rate (PP Sample)",
  col.main = BITBlack,
  y = c(control_pp, treatment_pp),          ## bar heights
  barXLabels = c("Control","Treatment"),    ## bar labels
  CMin=c(control_pp,treatment_pp-treatment_estimate_lower_pp), ## lower CI limit of mean - 1.96 SDs
  CMax=c(control_pp,treatment_pp+treatment_estimate_upper_pp), ## upper CI limit of mean + 1.96 SDs
  ylab="Attendance Rate (%)",               ## Y axis label
  yline = 1,                               ## move the label out by 1 line so it doesn't overlap
  extramar = 1,
  barCol = "#C6D3DF",
  N = 4040,
  analysisType = "secondary",
  p=c(1,treatment_p_pp),                   ## p-values
  subtitle = "*** p<0.01, * p<0.05, + p<0.1",
  line.main = 1
)
```



## Appendix H: IPE materials

Tutor provider interview topic guide

| Main objective                                                           | Purpose of section                                                                                                                                                                      | Guide timings |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1. Introductions and background                                          | Explain the purpose and ground rules for the interview.                                                                                                                                 | 2.5 mins      |
| 2. Overview of the NTP tutoring program                                  | To get an overview of key delivery partners background and their experience coordinating the NTP                                                                                        | 5 mins        |
| 3. Overview of TP's typical engagement with tutors                       | To understand how the tutor partners interact with the tutors and prepare them for their tutoring sessions.                                                                             | 5 mins        |
| 4. Overall understanding of and thoughts on the SnapSurvey activity      | To explore the Tutor providers' understanding of the SnapSurvey intervention, how it compares with BAU practices and their perceptions of the interventions and the impact it may have. | 10 mins       |
| 5. Overall thoughts on delivering the intervention - compliance/fidelity | To understand the extent to which the tutor providers delivered the intervention with fidelity and the barriers and facilitators which may have impacted the delivery.                  | 10 mins       |
| 6. Ideas and feedback on changing the process                            | To understand how the delivery of the intervention could be improved.                                                                                                                   | 2 mins        |
| 7. Close                                                                 | Thank you and close.                                                                                                                                                                    | 2.5 mins      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1. Introductions and background                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2.5 mins |
| <p>My name is Sara/Callum I work for the Behavioural Insights Team.</p> <ul style="list-style-type: none"> <li>• We've been working with the EEF to design, deliver and evaluate a set of activities for tutors and pupils on the NTP programme.</li> <li>• As part of the evaluation, we're running an implementation and process evaluation to understand how the activities have been delivered and the outcomes reported by stakeholders such as yourself.</li> </ul> <p>Aim of this interview:</p> <ul style="list-style-type: none"> <li>• The purpose of this interview is to gain understanding of your experiences supporting tutors in delivering the "Snap Survey" activity.</li> <li>• We'd like to explore your views and perceptions of the processes, as well as any feedback you have regarding the activity.</li> </ul> <p>This interview</p> <ul style="list-style-type: none"> <li>• should take up to 30 minutes</li> <li>• We would like to know your thoughts and understand your point of view - there are no right or wrong answers to any of our questions</li> </ul> <p>Reiterate key points</p> <ul style="list-style-type: none"> <li>• Will not use your name in any reports we write up; we might use quotes, but we will de-identify them first</li> <li>• If you feel uncomfortable answering a question we can just skip it</li> <li>• If you later change your mind about anything you have said - let me know, that's absolutely fine too</li> <li>• Just say at any point if you want to stop altogether - this is not a problem and you do not have to give a reason for stopping</li> <li>• Check if they have any questions before starting</li> </ul> <p>Recording</p> <ul style="list-style-type: none"> <li>• With your permission, I'd like to audio record the conversation, to ensure we capture everything you said correctly, in your own words; will have transcript</li> <li>• [Suggest switching video off if not possible to only record audio]</li> <li>• Gain verbal consent (not recorded) and start the audio recorder</li> </ul> |          |
| 2. Overview of the NTP tutoring programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5 mins   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <p>Introductory rapport building</p> <ol style="list-style-type: none"> <li>1. Can you tell me a bit about your current role at [Tutor provider]? <ul style="list-style-type: none"> <li>- How long have you had this role for?</li> <li>- What are your day-to-day responsibilities?</li> </ul> </li> <li>2. How have you found your role as a tutoring provider on the NTP? <ul style="list-style-type: none"> <li>- What challenges, if any, have you faced?</li> </ul> </li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |
| <p>3. Overview of TP's typical engagement with tutors</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>10 mins</p> |
| <ol style="list-style-type: none"> <li>1. Can you tell me how you normally go about getting your tutors ready for tutoring?</li> <li>2. How do you interact with tutors once their tutoring relationships are set-up? <ul style="list-style-type: none"> <li>- What channels do you use?</li> <li>- How often do you reach out to tutors?</li> <li>- What challenges, if any, do you face? (e.g. tutor engagement, tutor responsiveness,</li> <li>- What factors make it easier, or more difficult, to interact with tutors? (e.g. tutors level of experience, tutors level of motivation, time, number of pupils per tutor)</li> </ul> </li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |
| <p>4. Overall understanding of and thoughts on the SnapSurvey activity</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>10 mins</p> |
| <p>As part of the NTP programme, you were asked to deliver an activity, SnapSurvey, to your tutors.</p> <p>A web-based survey that provides instant feedback on similarities, accompanied by:</p> <ul style="list-style-type: none"> <li>• An implementation guide for tutors</li> <li>• A short implementation video</li> <li>• An email with a list of similarities sent to tutors immediately after completing the survey</li> <li>• A weekly email to tutors (for 5 subsequent weeks after completing the initial survey) reminding them of similarities they have with each pupil</li> </ul> <p>I'd now like to hear about your experiences delivering the Snap Survey activity to your tutors.</p> <p>Let's start by discussing the activity itself.</p> <ol style="list-style-type: none"> <li>1. Please could you outline what your understanding of the activity is? <ul style="list-style-type: none"> <li>- What do you think the purpose of the intervention is?</li> </ul> </li> <li>2. What are your thoughts on the activity? <ul style="list-style-type: none"> <li>- Tap into need, quality and impact</li> </ul> </li> <li>3. How does the intervention fit with the way your tutors typically work?</li> </ol> |                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <ul style="list-style-type: none"> <li>- Are there any other similar training resources / activities you currently provide tutors with?</li> <li>- If so, what are these?</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |         |
| 5. Overall thoughts on delivering the intervention - compliance/fidelity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10 mins |
| <p>The next set of questions relate to your experiences delivering the activity.</p> <p>The web-based survey asks pupils and tutors about their personal interests, hobbies and preferences. Once completed, both tutors and pupils will receive instant feedback on their similarities, as well as prompts to discuss these. Tutors then receive reminders of their similarities with their pupils for the subsequent 5 weeks, including some suggested conversation prompts.</p> <p>BIT will instruct the tutoring providers to share the intervention materials in the same week as randomisation, and will seek written confirmation that the materials have been sent as agreed. Tutors will then be sent 2 reminders to complete the intervention in the week after receiving the materials - these will be delivered by the tutoring providers.</p> <ol style="list-style-type: none"> <li>1. What role did you play in delivering the Snap Survey activity? <ul style="list-style-type: none"> <li>- How were you briefed on your role?</li> <li>- Were the requirements clear?</li> <li>- Did you feel prepared for your role in delivering the activity?</li> <li>- If not, what could be done to improve this if the activity was repeated?</li> </ul> </li> <li>2. Could you describe how you delivered the activity to your tutors? <ul style="list-style-type: none"> <li>- Who did you send the activity to and why? (C/T)</li> <li>- How was the activity sent to tutors? <ul style="list-style-type: none"> <li>- Any additional resources?</li> <li>- Through what channel?</li> <li>- When?</li> </ul> </li> <li>- Did you send any follow-up materials or activities?</li> </ul> </li> <li>3. How did you find delivering the activity to tutors? <ul style="list-style-type: none"> <li>- What worked well?</li> <li>- What was challenging?</li> <li>- What could be done to solve these issues?</li> </ul> </li> <li>4. Did tutors contact you in relation to the Snap Survey activity? <ul style="list-style-type: none"> <li>- What sort of questions did they ask you?</li> <li>- How easy, or difficult, was it for you to answer their questions? <ul style="list-style-type: none"> <li>- If difficult - what could have been done to better support you?</li> </ul> </li> </ul> </li> <li>5. Is there anything that could be done to improve the delivery process? <ul style="list-style-type: none"> <li>- More communication or information on the activity from BIT?</li> <li>- Any additional resources?</li> <li>- More opportunities for tutors to ask questions?</li> <li>- Timing - should the intervention have been sent to tutors sooner or later?</li> </ul> </li> </ol> |         |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6. Feedback on the delivery and intervention from tutors (or pupils)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2-5 mins |
| <p>Lastly, we are interested in your perception of how tutors and their pupils engaged with the activity.</p> <ol style="list-style-type: none"> <li>Did you receive any feedback from tutors and/or their pupils? <ul style="list-style-type: none"> <li>If yes - What feedback did you receive?</li> <li>How do you think that they perceived the activity?</li> <li>How helpful, if at all, did they find the activity?</li> <li>Did either pupils or tutors report any impact on attendance or engagement in session, resulting from the SnapSurvey?</li> </ul> </li> </ol> |          |
| 7. Close                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2.5 mins |
| <p>Is there anything else we have not covered that you think would be helpful for us to know?</p> <p>Thank you for your time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |

#### Tutor interview topic guide

| Main objective                                                                                 | Purpose of section                                                                                                                                                                                                                                | Guide timings |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1. Introductions and background                                                                | Explain the purpose and ground rules for the interview.                                                                                                                                                                                           | 2.5 mins      |
| 2. Rapport building and overview of the NTP tutoring programme / intervention delivery context | To get an overview of tutors' background and their NTP tutoring experience.<br>To understand the context within which tutors delivered the intervention.                                                                                          | 10 mins       |
| 3. Overall thoughts on completing the intervention                                             | To get an overview of whether tutors completed the intervention ( <i>compliance</i> ), what they thought of the intervention ( <i>quality</i> ) and how they implemented it ( <i>fidelity</i> ), including perceived facilitators and barriers to | 15 mins       |

|                                               |                                                                       |          |
|-----------------------------------------------|-----------------------------------------------------------------------|----------|
|                                               | integrating the intervention in their tutoring ( <i>mechanisms</i> ). |          |
| 4. Ideas and feedback on changing the process | To understand how the intervention could be improved.                 | 5 mins   |
| 5. Close                                      | Thank you and close.                                                  | 2.5 mins |

| 1. Introductions and background                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2.5 mins |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <p>My name is Sara/Callum. I work for the Behavioural Insights Team.</p> <ul style="list-style-type: none"> <li>• We apply behavioural insights to inform policy and improve public services.</li> <li>• We've been working with the EEF to design, deliver and evaluate a set of activities for tutors and pupils on the NTP programme.</li> <li>• As part of the evaluation, we're running an implementation and process evaluation to understand how the activities have been delivered and the outcomes reported by stakeholders such as yourself.</li> </ul> <p>Aim of this interview:</p> <ul style="list-style-type: none"> <li>• The purpose of this interview is to gain understanding of your experiences of the SnapSurvey tool.</li> <li>• We'd like to explore your views and perceptions of the processes, as well as any feedback you have regarding the activity.</li> </ul> <p>This interview</p> <ul style="list-style-type: none"> <li>• should take up to 30 minutes</li> <li>• We would like to know your thoughts and understand your point of view - there are no right or wrong answers to any of our questions</li> </ul> <p>Reiterate key points</p> <ul style="list-style-type: none"> <li>• Will not use your name in any reports we write up; we might use quotes, but we will de-identify them first</li> <li>• If you feel uncomfortable answering a question we can just skip it</li> <li>• If you later change your mind about anything you have said - let me know, that's absolutely fine too</li> <li>• Just say at any point if you want to stop altogether - this is not a problem and you do not have to give a reason for stopping</li> <li>• Check if they have any questions before starting</li> </ul> <p>Recording</p> <ul style="list-style-type: none"> <li>• With your permission, I'd like to audio record the conversation, to ensure we capture everything you said correctly, in your own words; will have transcript</li> <li>• [Suggest switching video off if not possible to only record audio]</li> <li>• Gain verbal consent (not recorded) and start the audio recorder</li> </ul> |          |
| 2. Rapport building, overview of the NTP tutoring programme, delivery context                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10 mins  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <ol style="list-style-type: none"> <li>1. Can you tell me a bit about your role as a tutor for [TP name]? <ol style="list-style-type: none"> <li>a. How many pupil(s) do you tutor? [TP and other]</li> <li>b. How often do you tutor?</li> <li>c. How many sessions have you had with your pupil(s) to date?</li> <li>d. How long have you been tutoring for? [general]</li> </ol> </li> <li>2. Can you describe what the process of being set-up as a tutor with [TP name], and later matched with your pupil(s), looked like? <ol style="list-style-type: none"> <li>a. What steps?</li> <li>b. What training and materials did you receive? [from TP or other]</li> </ol> </li> <li>3. How have you found [this experience, the level of training &amp; support provided]? <ol style="list-style-type: none"> <li>a. Any challenges? [with TP, NTP or other]</li> </ol> </li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |
| <p>3. Overall thoughts on delivering the intervention</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>15 mins</p> |
| <p>The next set of questions relate to one specific component of your role as a tutor which is tutor-pupil relationship building.</p> <ol style="list-style-type: none"> <li>1. How do you typically go about doing this? <ol style="list-style-type: none"> <li>a. Are there any particular steps you take or tools/strategies you use (to get to know your pupil(s) / build tutoring relationships with them)?</li> <li>b. Any training and materials? [from TP or other]</li> <li>c. Any communications? [from TP or other]</li> <li>d. What factors influence this? (i.e. what makes it easier/more difficult).</li> </ol> </li> <li>2. What challenges (to relationship building) have you faced in the past? <ol style="list-style-type: none"> <li>a. How did you overcome these?</li> </ol> </li> </ol> <p>Recently, as part of your NTP training package, you were invited by your tutoring provider to take part in <i>SnapSurvey</i>, a web-based tool for tutors and pupils.</p> <ol style="list-style-type: none"> <li>1. Do you remember receiving this tool? (IF NO - describe the tool &amp; ask for perceived quality / need)</li> </ol> <p>[If YES]</p> <ol style="list-style-type: none"> <li>2. Did you use this tool? Why/why not? (<i>motivation or logistical reasons?</i>) <ol style="list-style-type: none"> <li>a. Did your TP encourage you to use this tool?</li> </ol> </li> <li>3. <b>What do you think was the purpose of the tool?</b> (E.g. to help tutors identify similarities with their tutees to help improve relationship building and boost pupil attendance in tutor sessions).</li> </ol> |                |

If did not take part:

1. Are there any changes that could be made to SnapSurvey that would encourage you to take part in the future?
2. Are there any changes that could be made to the wider context of tutoring that would encourage you to take part in the future?

End interview.

If did take part:

1. What do you recall doing as part of SnapSurvey?
2. How did you find using the tool? (E.g. *onboarding, usability, content*)
3. How did you find integrating the tool into your tutoring plan?
  - a. How did this differ from your usual practice?
4. Did the tool impact your tutoring? How so?

We would now like to go through the first few stages of the *Snap Survey* activity in more detail.

1. **Could you describe to me how you completed the web-based survey, as part of your tutoring?** (E.g. web-based survey asking pupils and tutors about their personal interests, hobbies and preferences)
  - a. When did you complete the survey? How long did this take?
  - b. What did you think of the survey?
  - c. Did you encourage your pupil(s) to complete the survey? How so?
  - d. Did your pupil(s) complete the survey?
  - e. What worked well? What didn't work well?
  - f. Were there any issues which prevented you and your pupil(s) from completing the survey?
  - g. (If applicable) did you receive the results of the survey?
2. You mentioned that your pupil(s) [did / did not] complete SnapSurvey
  - a. If pupil did not complete the survey: did you make use of the activity in another way?
  - b. If pupil did complete the survey: what did the survey reveal about your similarities or differences with your pupil?
3. **How did you find the feedback that you received following the survey?** (once both pupils and tutors have completed the survey, both will receive instant feedback on their similarities, as well as prompts to discuss these)
  - a. Did you use this feedback for your tutoring? How so?

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <p><b>b.</b> What worked well? What didn't work well? (level of similarity, pupil(s) characteristics, pupil(s) engagement)</p> <p><b>c.</b> (If applicable) Can you provide any examples of topics you discussed with your pupil(s) as a result of the <i>Snap Survey results</i>?</p> <p>There are a number of weeks of the activity still to go, but at this stage we would like to know...</p> <p>5. What is your overall perception of the communications you received in relation to the <i>Snap Survey activity</i>? (E.g. emails, step-by-step guide for tutors, walk-through video)</p> <p><b>a.</b> How clear was it what you were being asked to do?</p> <p><b>b.</b> What did you feel prepared to do, following this?</p> <p><b>c.</b> How could this process be improved? (E.g. more information or training)</p> <p>6. What impact, if any, do you think completing the <i>SnapSurvey</i> activity has had so far on you and your pupils?</p> <p><b>a.</b> Has the activity helped you to get to know your pupil(s) or has it made it more difficult?</p> |                 |
| <p>4. Ideas and feedback on changing the process &amp; materials</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>5 mins</p>   |
| <p>We would find it extremely useful to know what else you think could be improved.</p> <p>1. If you could make any changes to the tool what changes would you make?</p> <p>2. If you could change anything in the wider context of tutoring to make it easier to use the tool what would that be?</p> <p>3. Would you recommend the tool to other tutors?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <p>Close</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p>2.5 mins</p> |
| <p>Is there anything else we have not covered that you think would be helpful for us to know?</p> <p>Thank you for your time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |

## Appendix I: Timeline

Figure 4: Timeline

| Date                   | Activity                                              | Staff responsible |
|------------------------|-------------------------------------------------------|-------------------|
| February 2021          | Trial set up                                          | BIT, TPs, EEF     |
|                        | Finalise intervention materials                       | BIT, TPs, EEF     |
|                        | Rolling randomisation for new tutors begins           | BIT, TPs          |
|                        | Launch trial (15 Feb)                                 | BIT, TPs          |
| February - August 2021 | Tutor reminders to use the intervention (from 22 Feb) | BIT, TPs          |
|                        | Follow-up emails to tutors                            | BIT               |
|                        | Monitoring trial                                      | BIT, TPs          |
|                        | IPE interviews conducted                              | BIT, TPs          |
|                        | IPE observations conducted                            | BIT, TPs          |
| September 2021         | NFER receives data from TPs                           | NFER, TPs         |

|                              |                               |               |
|------------------------------|-------------------------------|---------------|
| November - December 2021     | NFER sends BIT data           | BIT, NFER     |
|                              | Impact and IPE analysis       | BIT           |
|                              | Reporting                     | BIT           |
| January 2022 - February 2022 | Report review and publication | BIT, TPs, EEF |

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