Research Protocol: A cluster randomised controlled trial to evaluate the Family SKILLS programme for reception year students from families in which English is an additional language

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Abstract: This paper describes a cluster randomized controlled trial of Family SKILLS, an intervention targeted at reception year children and their parents for whom English is an additional language. The trial will commence in the autumn of 2016 and run for one year. 155 primary schools in England will take part in the study. NatCen Social Research has been appointed to conduct the trial by the Education Endowment Foundation, the Bell Foundation and Unbound Philanthropy who are co-funding this research. The Family SKILLS intervention will be delivered by a number of delivery partner organisations coordinated by a consortium comprising Learning Unlimited, the Campaign for Learning and University College London, Institute for Education.

Key words: research protocol, family literacy, randomized controlled trial, early education, literacy

1. Background

This protocol describes a cluster randomized controlled trial (CRT) to test the efficacy of Family SKILLS (Supporting Kids in Literacy, Learning and School). Family SKILLS is an intervention targeted at reception-year parents/carers and their children (aged 4-5 years) for whom English is an additional language (EAL) and attending English primary schools. The design of the Family SKILLS intervention is based on a range of the family literacy programmes that were previously largely funded by the Skills Funding Agency in England. The Family SKILLS literacy programme aims to support families in developing their children's English and literacy skills. It seeks to achieve this by equipping parents with a greater knowledge of how their children are taught to read in school. Furthermore, the intervention aims to developed parents' English language skills directly and acquaint them with strategies and activities to support their children's literacy at home. In developing these new skills and in gaining knowledge, it is anticipated that parents will grow in confidence and engage more closely in their children's learning. Ultimately, this should lead to improvements in literacy and language skills among children.

Family literacy interventions have traditionally been delivered in primary school settings and have targeted children aged between four and seven years and their parents (Swain, Cara, Vorhaus, & Litster, 2015). Recognising that parental education and skills are key determinants of children's attainment, the last Labour government (1997 to 2010) saw family literacy programmes as playing a central role in increasing social inclusion and tackling intergenerational

disadvantage (Department for Children Schools And Families, 2007; Department for Innovation Universities & Skills, 2007). This approach continued under the Coalition government (2010-15), however, the funding for these programmes became increasingly complex and local authorities gained greater discretion over how budgets were spent, with more emphasis on working in partnership to deliver learning.

The critical role parents can play in supporting their children's literacy and language development has been well documented over recent years (see Anderson, et al., 2010; Anderson & Morrison, 2007; Carpentieri, et al., 2011; Desforges & Abouchaar, 2003; Feinstein, Duckworth, & Sabates, 2004; Hodge, 2006; Swain et al., 2009; Swain, Brooks, & Bosley, 2013; Swain & Brooks, 2012; Wagner, Spiker, & Linn, 2002). Carpentieri, et al., (2011) examined six meta-analyses of evidence on family literacy interventions concluding that they have a stronger impact on children's literacy acquisition than many other educational interventions. Five of these six meta-analyses found effect sizes greater than 0.3, and in two studies effect sizes greater than 0.5. However, as Brooks, et al., (2008) noted in their review of quantitative studies of family literacy programmes, such interventions have less frequently been evaluated using rigorous experimental or quasi-experimental approaches. Of the 17 studies examined by Brooks et al., (2008) seven were RCTs or quasi-experimental designs. Furthermore, of the UK-based family literacy studies only two were RCTs whilst two adopted a quasi-experimental design[1].

[1] The two RCTs of family literacy interventions previously undertaken in the UK are the REAL and PEEP trials (Brooks et al., 2008). REAL was an intervention with children and families from areas of multiple deprivation in Sheffield and the evaluation produced the effect size of 0.41 in

Swain and colleagues provide a more recent review of studies examining the effectiveness of family literacy interventions (Swain et al., 2015). They concluded that there was a need for more scientifically rigorous research designs comprising control or comparison groups and that there was a lack of studies in England (studies in the main came from North America, Europe and elsewhere). Furthermore, little attention has been given to how family literacy programmes work and insufficient account taken of softer more qualitative outcomes.

Whilst in general the evidence-base for Family Literacy programmes is lacking rigorous studies, there is even less of such evidence for family literacy programmes addressing the needs of EAL children and their families. Jeynes (2003) in his meta-analysis provides evidence for the positive effect of parental involvement on minority students' academic achievement – though this review does not appear to look at interventions to raise parental involvement but instead draws largely on observational studies. Manz, et al., (2010) conducted a review of 14 studies that utilized an experimental or quasi-experimental design and that looked broadly at family-based literacy interventions for ethnic-minority, low-income or non-English speaking families. The review found an overall effect size of 0.33 but it appears that few if any of these studies were undertaken in England. Harper, Platt, & Pelletier (2011) evaluated a Canadian family literacy programme exploring its impact on EAL children's early reading development by comparing their progress to that among children where English

literacy development. The other intervention, PEEP, worked with children and families in a deprived area of Oxford and showed gains in different domains of literacy ranging from 0.14-0.34 (effect size).

was the first language (EL1 children). They found that children with EAL demonstrated greater gains in their ability to infer meaning from printed/written sources compared to EL1 children and EAL children who did not participate in the intervention. Finally, a study undertaken in the United States (Cronan, Cruz, Arriaga, & Sarkin, 1996) adopting an RCT design, involved the evaluation of a high-intensity community-based intervention designed to train parents in supporting their children's literacy and language development. The study concluded that the intervention was effective among low-income children from minority ethnic families.

Whilst the evidence-base in support of family literacy programmes has sporadically adopted experimental or quasi-experimental approaches, the evidence with regard to how effective such programmes might be among EAL children, particularly in the England, is scant indeed. To address this gap in the evidence base, the Education Endowment Foundation (EEF) are funding this trial of the Family SKILLS intervention with reception year pupils and their parents/caregivers in 155 primary schools across England.

The aim of the trial is to test the specified intervention with significant input and involvement from programme developers. Therefore, the funders of this trial have designated it an efficacy study (Education Endowment Foundation, 2015). Eligible children will be those reception year pupils identified as having English as an additional language. All eligible families in the treatment schools will be invited to take part in the intervention which will be delivered from January to

April 2017. All eligible parents/caregivers who wish to take up the intervention will be able to do so.

2. Intervention

The Family SKILLS literacy programme comprises parents and their children receiving support through 30 hours of family literacy sessions delivered in school, with parents expected to conduct follow up activities at home. The sessions are typically three hours long, delivered over one term, with half of sessions involving parents only, and half parents and children learning together. The sessions will include: an introduction to education in England and the culture of schools; reading strategies and phonics; home literacy practices; oral traditions (including storytelling, songs and rhymes); learning through play; and how to make the most of bilingualism. The programme aims to support families in developing their children's English and literacy skills by equipping parents with greater knowledge of how their children are taught to read, developing parents' English language skills and acquainting parents with strategies and activities to support their children's literacy development at home. These new skills and knowledge should lead parents to grow in confidence and engage more closely in their children's learning. Ultimately, this should lead to improvements in literacy among children.

The trial of Family SKILLS described here is funded by the Education Endowment Foundation, the Bell Foundation and Unbound Philanthropy and is being led by 'Learning Unlimited', working in partnership with and 'Campaign for Learning' and University College London, Institute for Education. The

programme will be implemented in collaboration with 16 delivery partner teams across England.

3. Research plan

The evaluation is a CRT, accompanied by a process evaluation. This protocol discusses the CRT element of the study only.

Eligible children and parents/carers will be those where the focal child is in reception year and identified as having English as an additional language. All such eligible children and their parents in schools assigned to treatment will be invited to take part in the programme which will be delivered from January to April 2017.

3.1 Research questions

The CRT element of this study will answer three key research questions:

- What is the impact of the Family SKILLS programme over the course of one academic year on the literacy skills of reception year pupils with EAL?
- What are the impacts of the Family SKILLS programme on key intermediate outcomes such as home literacy environment?
- To what extent is Pupil Premium Status, gender and baseline English language fluency/literacy attainment associated with differences in the effectiveness of the Family SKILLS programme?

3.2 Key trial design considerations

This trial is designed as a CRT. Schools have been chosen as the unit of randomisation as they are the unit of programme delivery. Therefore, pupils are nested or clustered within classes, which are in turn clustered by school, and schools clustered by delivery partner. Although CRTs in which whole schools are allocated at random to treatment and control conditions generally have lower statistical power than trials where individual pupils are the unit of randomisation (for a given pupil sample size), they possess the benefit of removing bias from effect size estimates resulting from interference between pupils (Jo, Asparouhov, Muthén, Ialongo, & Brown, 2008; Raudenbush, 2008). Such biases can occur where a given pupil's attainment is affected not just by their exposure to the intervention but by whether pupils within the same school or class setting receive treatment (Bloom, Bos, & Lee, 1999; Raudenbush, 2008). Were individual pupils to be randomised to treatment and control groups in the case of Family SKILLs, it was felt likely that such interference would occur adding further support to the case for a CRT.

155 primary schools from around England will be recruited into the trial. These schools will be randomly assigned (by NatCen) into one of two intervention conditions on a one-to-one basis:

- Schools in Group 1 (treatment schools) will receive the Family SKILLS programme and 'business as usual' support during school hours
- Schools in Group 2 (control schools) will continue with 'business as usual' support during school hours

Business as usual is likely involve other interventions designed to improve the literacy of all reception year pupils and those with EAL. For reception year EAL pupils the majority of such support is provided at present within school hours, or at least is not a direct substitute for Family SKILLS. The trial will not stipulate that treatment and control schools desist from providing existing planned support to EAL pupils during the trial. This means that the trial will be estimating the effects of Family SKILLS over and above business as usual support. Control schools will be offered a financial incentive for taking part in the evaluation in an attempt to limit the extent of withdrawal from the study.

Once the study has finished, both treatment and control schools will be able to receive the Family SKILLS intervention if they proactively seek provision. As a result, there is a risk that children in the control cohort could receive some benefits of the intervention in the future if their parents take up the intervention for younger siblings and that the treatment group pupils will potentially be exposed again to the programme through a sibling. With respect to estimating the impact of the Family SKILLS on our study sample over the course of more than one academic year, such potential patterns in future take-up are a potential problem[2]. If exposure across the treatment and comparison groups differs, the long-term impact estimates might be contaminated by such subsequent behaviour. We consider the overall risks, however, to be low and not to outweigh other considerations, because:

[2] Note the longer term impacts of Family SKILLS on attainment, for example at the end of Key Stage 2, are outside the scope of this current evaluation protocol

- Not all control and treatment schools will choose to take up the programme in subsequent years; and
- Take-up in subsequent years through sibling involvement may not vary appreciably in the two arms of the study;

Eligible children will be all reception year pupils identified by schools as having English as an additional language (EAL). This opens up the possibility that different definitions of EAL might be used by schools across the study sample. However, since the programme is aimed at EAL pupils as defined by schools using a school-based definition of EAL is consider suitable[3]. Moreover, participating schools will be asked to identify reception year EAL pupils prior to randomisation which means that any idiosyncrasies in definition will not be influenced by the outcome of the randomization process and the particular definitions applied are no more or less likely to be found in one arm of the trial than another.

A further challenge that informs the design of this study, was the understandable reticence of delivery partners to recruit EAL pupils and their parents/carers to the intervention in advance of randomisation. The final agreed study design merely requires schools and delivery partners to identify pupils they deem to be

[3] Note, the Department for Education (DfE) have recently introduced a new requirement for schools to record a Proficiency in English rating for all pupils' in reception year and above for whom Language has been recorded as anything other than 'English' or 'Believed to be English' in that census. Following an initial collection during the autumn 2016 school census, the collection of proficiency in English will move to an annual collection from the spring 2017 census onwards. The DfE anticipates that the initial collection of English language proficiency from September 2016 will be challenging in terms of capacity to assess all pupils, and expects some pupils to be classified as 'Not yet assessed'. A full assessment of all relevant pupils using the 5-point Proficiency in English scale is expected by the time of the 2017 spring census. As a result, we opted to use a binary indicator for EAL status as defined by schools to define eligibility for the trial and the Family SKILLS programme.

EAL within each school prior to randomisation. EAL pupils and their parents/carers are only approached and recruited into the programme subsequent to randomisation. Delivery partners were reluctant to recruit pupils to the programme in advance of randomisation due to the perceived awkwardness of having to inform those who came forward to take part, but in schools subsequently assigned to the control group, that they could no longer participate. From the perspective of the study design this creates a challenge but reflects the pragmatic nature of many school-based trials. In order for estimates of effect sizes to remain unbiased the equivalence in the trial arms achieved at randomisation needs to maintained as far as is possible in the sample 'as analysed'. This means that the analysis proceeds on the basis of intention to treat. In the case of this study, the intention to treat 'as analysed' sample will, however, be all reception year pupils defined by participating schools as EAL, rather than EAL pupils and their parents/carers who take part. This definition leaves open the possibility that substantial numbers of reception year pupils identified as EAL and thus members of the intention to treat sample may fail subsequent to randomisation to take-up the programme even though allocated to the treatment group. This 'non-compliance', or less than 100 per cent take-up, will potentially dilute the impact of the intervention as observed in the intention to treat sample defined at or prior to randomisation. Furthermore, the average effect of the intervention in the intention to treat sample is likely to differ to the average effect of treatment on those that actually take-up treatment. In order to estimate this latter parameter data that accurately measure take-up of the programme will be required. The NatCen team will be responsible for ensuring that delivery partners keep accurate records of attendance for this purpose.

Finally, as discussed in Section 6, we have attempted to the explore the effects of various levels of programme take-up in our power calculations.

4. Outcome measures and instruments

4.1 Pupil level outcomes

To assess the impact of the Family SKILLS intervention, all enumerated reception year pupils with EAL from intervention and control schools will be assessed on their literacy proficiency toward the beginning and at the end of reception year. The baseline test will take place in the October 2016, prior to randomisation, and the post-intervention test (follow-up) in June/July 2017. Both baseline and follow-up testing will be conducted over a two-week period.

Both follow-up and baseline testing will use the Centre for Evaluation and Monitoring (CEM) BASE reception baseline assessment, using the CEM Inspection Ready package[4]. This test is an online literacy and numeracy assessment, which will be administered by Teaching Assistants or another member of school staff within the schools. The justification for the selection of the CEM BASE progress assessment is as follows:

- The assessment explicitly captures the dimensions of literacy and English language skills that the programme aims to affect.
- It is adaptive, minimising the risk of floor effects when assessing literacy among reception year pupils with EAL.

[4] Further details about the assessments can be found here: http://www.cem.org/reception-baseline-assessment

- Using CEM at both baseline and post-intervention phases minimises the burden on school staff involved in administering the test compared to alternative available reception-year assessment options, as it involves the same (adaptive) assessment at both points in time. Staff implementing the test therefore only need to become familiar with one test.
- As will be discussed in Section 6 below, proposed adjusted analysis of treatment effects will involve the inclusion of baseline test scores as a covariate in a multi-level regression model, where attainment scores measured at follow-up will be the dependent variable. The fact that the same test is used at both baseline and follow-up should increase the precision of any resulting estimates.
- It will also enable the Education Endowment Foundation to use additional follow up equivalent assessments at Key stage 1 and 2 to measure longer-term effects of the Family SKILLS programme if desirable
- Finally, as a computer based test, the CEM assessment has the advantage of not requiring data entry and marking.

The lack of blinding of data collectors remains a limitation of the trial. However, we believe that the potential for bias is limited. The programme is delivered by third party delivery partner organisations with minimal input from teachers, teaching assistants and other members of staff likely to conduct pupil testing. As a result, school-staff overseeing testing will have only minimal, if any, vested interest in the outcome of the trial. Additionally, due to the objective nature of the online pupil test, there is limited scope for teaching assistants to affect the outcomes of the assessment. To mitigate potential bias, schools will generally be

advised to select a teaching assistant or other member of staff that is not directly involved in the Family SKILLS programme to oversee pupil testing.

4.2 Parent level outcomes

Pre and post data will also be collected from parents in both treatment and control schools through administering a parent survey at baseline and post-randomisation. The Family SKILLS programme is expected to result in improved outcomes for pupils in part through changes to the 'home literacy environment'. The home literacy environment can be interpreted as a mechanism that in part transmits the causal force of Family SKILLS and acts on the primary attainment outcome. Parent surveys will therefore contain questionnaire items that will enable measures of home literacy environment to be derived.

There is extensive research literature on the subject of home literacy environments (HLE) and its relationship to the acquisition of language and literacy skills among children. However, unlike home learning environment measures (Feinstein et al., 2004; Melhuish, Phan, et al., 2008; Melhuish, Sylva, et al., 2008), there's no set index for measuring the home literacy environment. That said, there are well-established conceptual models of home literacy environment (Baker, 1992; Bennett, Weigel, & Martin, 2002; Burgess, 2011; Van Steensel, 2006). We will derive a measure of home literacy environment drawing on this literature, adapted to reflect the content of the programme and the context of EAL families. Drawing particularly on Van Steensel (2006) conceptualisations, the parent questionnaire will be designed to capture the following constructs:

- Active HLE –measures of the extent to which children participate in literacy activities at home.
- Passive HLE – measures of the extent to which children witness family members engaging in literacy activities, such as writing letters or shopping lists, and reading for pleasure.
- Limiting environment: measures of parents' educational attainment, parents' views on their role in teaching literacy, the importance of literacy at home (adapted from Weigel, Martin, & Bennett (2006)), and presence of literacy-related resources at home.

To account for the nature of the target population, questions will be included to capture the predominant language used when carrying out these activities.

The surveys will also include measures of key parent characteristics including proxy measures of parental English language ability such as parents' confidence in their English Language Skills (speaking, listening and understanding, reading, writing), whether parents consider themselves a native English speaker, whether parents ever attended education in the UK and whether parents have ever attended an English language course. Such data will enable exploratory estimates of the effect of family literacy training on parent's skills and practice.

The parent survey will be administered to parents / carers of pupils that schools identify as EAL. A paper questionnaire will be distributed to parents by schools with free-post return envelopes. Versions of the questionnaire will be provided in the 15 foreign languages most commonly represented in the schools

participating in the trial. Schools will be asked to share translated copies with parents who they feel might benefit from these and provide support for these parents via their community outreach / EAL liaison officers.

5. Sample

With support from NatCen and the Family SKILLS team, local delivery partners will identify and recruit schools. Schools will be recruited on the basis that they have higher than average proportions of pupils with EAL[5] and a minimum of two form entry, in order to maximise the numbers of families that are eligible to participate in the trial. Schools will be identified and recruited from summer 2016. Participating schools will be expected to complete a Memorandum of Understanding (MoU) which will also include school consent to be involved in the study (with an indication of willingness and capacity to facilitate and conduct testing for the trial).

In September 2016, eligible parents of EAL students will be informed about the possibility of participating in the trial, and asked to consent to their child being tested as part of the trial, and to their child's test data being linked to the National Pupil Database data (via an opt-out consent process). Each School participating in the trial will be asked to identify the children and parents/carers that have not opted out of the research, as well as an indication of the proportion of families that did opt out.

[5] With the average proportion of EAL pupils defined as 18% based on 2013 National Statistics (accessed at: http://www.naldic.org.uk/research-and-information/eal-statistics/eal-pupils/)

Following this, baseline data from prospective treatment and control group pupils will be collected prior to randomisation. Thus the sample for this trial will be all EAL pupils and their parents who have not opted-out of the study within participating trial schools and that provide baseline data prior to randomisation. It is this sample upon which intention to treat estimates of the effects of Family SKILLS on attainment and parental outcomes will be estimated.

5.1 Randomisation procedure

Schools will be assigned at random to treatment and control conditions at the beginning of November 2016 once baseline data collection is complete. Schools will be stratified by delivery partner, and within each delivery partner group assigned at random to treatment and control conditions such treatment and control groups of equal size are formed within each delivery partner-stratum. Thus EAL pupils and their parents/carers who have not opted out of the study and provided baseline data, in treatment schools, will form the treatment sample; the equivalent group in control schools the control sample.

The randomisation process will be as follows. Each school will be allocated a random number drawn from a uniform distribution within an Excel spread sheet. Within each stratum, schools will be arranged in descending order on the basis of their allotted random number. Two groups of schools will be formed within each stratum through assigning the first school in the arrangement to group A and the second to group B, and so on down the list until each school is assigned to one of the two groups. A coin toss will determine which of the two groups, A or B, are to be the treatment group.

The randomisation will be carried out by a qualified statistician at NatCen who will be blinded with respect to the identity of the schools during the randomisation process and subsequently.

6. Analysis and sample power

6.1 Analytical model

In this section we discuss the main primary and secondary analysis that will be performed on the trial data. These analyses will be conducted alongside further exploratory statistical analyses that are not discussed in detail here and will not inform judgements as to the effectiveness or otherwise of Family SKILLS within the context of this trial.

The primary outcome will be the standardised measure of literacy attainment derived from the CEM test at follow-up among the EAL pupil sample. The secondary outcome will be a measure of Home Literacy Environment derived from the follow-up parent/carer survey.

For the primary analysis, effect estimates will be obtained from both adjusted and unadjusted analysis. In the unadjusted analysis the outcome measure derived from the CEM test will form the dependent variable, with effects estimate through a multilevel linear model containing a dummy variable indicator capturing treatment/control group membership and fixed effects for delivery partner stratification variables. The model will be a four level: pupil

(level 1), class (level 2), school (level 3) and delivery partner (level 4); with levels 2 and 3 modelled as random effects and the fourth as fixed effects. Reported effect sizes will come from the adjusted analysis performed through estimation of a four level multilevel linear model containing an indicator capturing treatment/control group membership, fixed effects for stratifying variables and pupil level baseline test scores. Effect sizes will be computed through dividing the coefficient on the treatment/control group indicator in the adjusted analysis by the level 1 variance obtained from a simple variance decomposition as described by Tymms (2004).

Subgroup impacts on the primary outcome will be estimated for groups defined by pupil premium status and gender at baseline, and by grouped baseline literacy attainment on the CEM BASE assessment. Estimation of subgroup effects on the primary outcome will involve the re-estimation of the adjusted model described in the previous paragraph with the addition of a further covariate for the particular subgroup concerned. This additional covariate will be interacted with the treatment/control group indicator. Where the coefficients resulting from this interaction reach statistical significance at the 95 per cent level, separate models will be estimated and reported for each subgroup.

For the secondary analysis the dependent variable will be a measure of Home Literacy Environment derived from the parent/carer survey at follow-up. The analysis will proceed in a similar fashion to the primary analysis, in that both adjusted and unadjusted models will be estimated. A three level linear model will include a treatment/control group indicator, random effects at the level of

the school and fixed effects at the level of the delivery partner, with the addition of a covariate capturing baseline measures of Home Literacy Environment in the adjusted model. Subgroup models by the focal child's gender, pupil premium status and baseline literacy attainment on the CEM BASE assessment will also be estimated using the same set of procedures as outlined for the primary analysis.

In addition to the primary and secondary analysis described here, further exploratory analysis will be undertaken. We do not provide an exhaustive account of these analyses here. One area for further investigation that will be pursued, however, is to examine the effects of various levels of take-up of Family SKILLS on attainment in the treatment group. This will involve fitting a multilevel linear regression model, with pupil attainment as the dependent variable, a measure of programme take-up as an independent variable along with a range of other control variables measured at baseline. Programme take-up will be defined as the number of sessions attended by each parent/carer. The key hypothesis to be tested is that pupils (and parents) that attend fewer sessions perform less well on average in tests of attainment than those that attend more sessions. This will be a non-experimental analysis and as such results will be merely indicative.

6.2. Sample power

We use the minimum detectable effect size (MDES) as the main metric through which sample power is evaluated for a range of potential sample sizes (Bloom, 1995; Dong & Maynard, 2013; Schochet, 2008). The MDES for a given sample size is defined by Orr (1999, p112) as:

> "The smallest true impact that would be found to be statistically significantly different from zero at a specified level of significance with specified power"

The assessment of statistical power is undertaken for the primary analysis.

In CRTs, the MDES is determined by a number of inputs, chief among which are the number of clusters randomised and the size of those clusters. In the case of this trial the key inputs are the number of schools randomised, the average number of classes per school and average number of pupils per class. Based on findings from a previous evaluation of a similar intervention (Swain et al., 2015), the research team took the decision to design the trial such that it was powered to detect an effect size of 0.20, or a fifth of one standard deviation. Thus 0.20 is the desired minimum detectable effect size. The following equation was used to calculate MDESs taking account of the clustering of schools by delivery partner, classes by school and pupils by class (Dong & Maynard, 2013); in other words, reflecting the choice of a four level linear model (discussed in Section 6.1) with randomisation at level three (the school), and with level four (the delivery partner) modelled as a fixed effect:

$$MDES = M_{L(K-2)-g_3^*}\sqrt{\frac{\rho_3(1-R_3^2)}{P(1-P)LK} + \frac{\rho_2(1-R_2^2)}{P(1-P)LKJ} + \frac{(1-\rho_2-\rho_3)(1-R_1^2)}{P(1-P)LKJn}} \text{.....[1]}$$

Where *M* represents a multiplier capturing the values from a T-distribution for required levels of statistical significance and sample power; ρ_3 and ρ_2 the values of the intra class correlation coefficients at levels 3 – the school – and level 2 the class; R_3^2, R_2^2 and R_1^2 the proportion of the variance explain by covariates where included in the model at levels 3, 2 and 1; and finally, '*P*' the proportion of clusters assigned to treatment, '*L*' the number of delivery partners, '*K*' schools, '*J*' classes and '*n*' pupils.

On the basis of estimates derived for the key variables in equation [1] obtained from previous research (Swain et al., 2015) and assumptions of 80% statistical power (or a Type II statistical error rate of 20%), statistical significance level of 95% for a two-sided test (or Type I statistical error rate of 5%), intra-class correlation coefficients (ICC) at school level of 0.11 and 0.05 at the class level, Table 1 below presents a range of sample sizes and MDESs. On inspecting Table 1, what is clear is that for a trial powered to detect an effect size on the primary outcome of 0.2, around 150-160 schools are required for randomisation (column 4, Table 1), hence the decision to recruit 155 schools to this trial. If each delivery partner is tasked with recruiting at least 10 schools, at a maximum the programme developers will need to engage 16 partners.

Table 1: Minimum detectable effect sizes – whole sample estimates – Intention to treat

Delivery partners	8	12	16	20
Schools per delivery partner	10	10	10	10
Total number of schools	80	120	160	200
Total number of reception year EAL pupils	3,440	5,160	6,880	8,600
MDES*	0.27	0.22	0.19	0.17
Notes: Schools assigned 1:1 to treatment control; alpha level 0.05; two-tailed				

	test, power 0.80. Rho at level 3 (between-school variance) assumed to be 0.11, at level two between class variance rho is assumed to be 0.05. Proportion of outcome and variances explained by covariates assumed to be .54 at level one (pupil level), 0 at level 2 (class level – we assume no class level covariates), and 0.02 at level 3 (school level). Calculations are performed using PowerUp: http://repository.upenn.edu/cgi/viewcontent.cgi?article=1265&context=gse_pubs *The MDES estimates in this table on the basis of Equation [1] are calculated using harmonic means (based on a sample dataset of schools that delivery partners have previously engaged with): schools per delivery partner = 7.72, classes per school = 2.6, EAL pupils per class = 11.33. In order to avoid underestimating the total number of schools required (due to the conservative nature of the harmonic mean), the numbers of schools, reception year pupils and EAL pupils reported in this table are arithmetic means calculated from the sample dataset: schools per delivery partner = 10, reception year pupils per school = 68, EAL pupils per school = 43.

As explained in Section 5, the study sample at level 1 will comprise all pupils identified by participating schools as EAL and whose parents/carers do not opt out of the trial prior to randomisation and for whom baseline measures are obtained. This is the study sample upon which intention to treat analysis will be performed.

At the pupil or family level, however, we cannot assume that all pupils assigned to the intervention go on to participate. Thus the intention to treat sample will include a proportion of pupils and parents who do not take up Family SKILLS even though they are eligible for it and have not opted-out. This non-compliance or failure to take up a place on the programme will dilute the treatment effect and lower sample power. We have modelled the effect of non-compliance among eligible parents/carers and pupils on MDESs based on an approach suggested by Duflo, Glennerster, & Kremer (2007) and adapted for the particular CRT design we are proposing. Assuming that delivery partners,

schools and classes do not drop out of the study, we have considered the effects of 80, 60 and 40 per cent average compliance rates among parents/carers and their children on the MDES reported in Table 1 column 4[6]. These analyses show that the full-compliance MDES of 0.19 rises to 0.20 with a compliance rate of 80 per cent, 0.21 with an average compliance rate of 60 per cent, and 0.23 with a compliance rate of 40 per cent[7]. The results from these analyses highlight that the loss of sample power resulting from non-compliance or failure to take up the intervention among those assigned to receive it is quite limited where it occurs at level 1 in the data (here the pupil level). However, our calculations also show that steps do need to be taken to prevent compliance rates falling too far below 50 per cent even at level 1. As a result, the research team will work closely with the programme developers and delivery partners to ensure take-up rates remain as high as possible.

7. Project team

The project is managed in the Children, Families and Work research group at NatCen Social Research. The trial manager will be Martina Vojtkova (Research Director), assisted by Lydia Marshall (Senior Researcher). Lydia and Martina will be supported by Sarah Frankenburg (Researcher) and Michael Lumpkin (Research Administrator). Professor Stephen Morris, (NatCen Research Associate) will lead on the evaluation design, oversee the randomisation process and analyses of trial data.

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[6] Note that in this additional analysis we assume that compliance rates do not vary substantially around the average for the sample as a whole. In other words, they are not affected by class or school characteristics.

[7] Details of these calculations can be available by the authors on request

8. Timetable

Date	Activity
Feb 2016	First set up meeting, evaluation design and cost revisions
Mar – May 2016	Second set up meeting, evaluation design and cost revisions, finalise primary outcome measures
	Design MOU and recruitment documents
	Ethics approval
May – September 2016	School Recruitment, signing of MOUs,
	Production of protocol, development of data collection tools and procedures (school information form, parent survey)
	Purchase pupil assessments, school scheduling appointment with NatCen and assessment set up checks
August-October 2016	Finalise data collection tools.
	Intervention Delivery and Evaluation Analysis meeting with delivery partners, finalise theory of change and analysis plan, design cost collection tools and processes
September 2016	Obtain parental consent, Baseline school information form and pupil enumeration
October 2016	Baseline pupil testing of an est. 6,665 EAL pupils in 140 schools
	Baseline pen-and-paper survey of an est. 6,665 eligible parents of EAL pupils in 155 schools (treatment and control schools)
Nov 2016	Randomise schools (78 Family SKILLS treatment schools, 77 control schools)
Nov – Dec 2016	Parent recruitment, development of process evaluation data collection tools
Jan – Apr 2017	Family SKILLS programme delivery
May – Jun 2017	Post-intervention parent survey of an est. 6,665 parents of EAL pupils in 155 schools (treatment and control group)
Jun – Jul 2017	Post-tests for an est. 6,665 EAL pupils in 155 treatment and control schools
Aug – Oct 2017	Data management, Analysis and Reporting
Jan 2018	Final report

9. Ethical considerations

NatCen has a robust ethics governance procedure. Research projects are scrutinised by the NatCen Research Ethics Committee (REC). The committee consists primarily of senior NatCen staff. If necessary, external research experts

or professional experts ('lay people') may also be invited to review individual studies. Depending on the nature of the research and the perceived level of risk, projects undergo either an expedited review (scrutiny by the REC Chair) or a full review by the sitting REC. For this evaluation we believe that a full review is appropriate.

The REC procedure is designed to provide ethical advice and guidance, and to ensure that all research undertaken by NatCen is ethically sound and meets the ethical standards of the Education Endowment Foundation and other funders. The process provides reassurance to potential research participants and, where relevant, to gatekeepers through whom they are approached.

The REC has conducted a full review of the design of this project, provided guidance that has been incorporated into this final protocol, and will continue to be involved on an ongoing basis, reviewing any changes to the project design.

The trial is registered on the ISRCTN registry with the study identifier: ISRCTN90043546[8].

[8] http://www.isrctn.com/ISRCTN90043546

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