

The
Brilliant
Club

Research Report Series

Protocol for Internal Research Projects

October 2017



About The Brilliant Club

The Brilliant Club exists to increase the number of pupils from under-represented backgrounds that progress to highly-selective universities. We do this by mobilising the PhD community to share its expertise with state schools. In pursuit of this mission, The Brilliant Club delivers two programmes:



The Scholars Programme recruits PhD researchers, trains them as university access professionals and places them as tutors in schools to deliver academically rigorous programmes to small groups of high-potential pupils.



Researchers in Schools recruits PhD graduates, places them as trainee teachers in schools and supports them to develop as excellent teachers and research leaders committed to closing the gap in attainment and university access.

The **Research Report Series** forms part of our Research and Impact Series, which provides three ways to engage with our work and that of our partners. Please click on the icons below to find out more:



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Contents

1. Introduction	4
1.1 Overview.....	4
1.2 The Brilliant Club's programmes.....	4
1.3 Research and impact.....	4
2. Internal Research Projects	5
3. Methodology.....	8
3.1 Participants.....	8
3.2 Design.....	9
3.3 Measures	11
3.4 Analysis.....	12
4. Overview of Internal Research Projects 2016/17.....	13
5. Conclusions and Next Steps	14
6. Bibliography	14
7. Acknowledgements.....	14

1. Introduction

1.1 Overview

This protocol marks the beginning of a series of research reports that focus on the internal research projects undertaken by The Brilliant Club. The research projects aim to understand the impact of our programmes on pupil outcomes, and how they can be further improved.

In this protocol we outline the methodological approaches that we use for our internal research projects, which form the basis of the charity's research and evaluation work. Subsequent reports in this series will contain detailed methodology and findings specific to each project. We hope this report will prove useful for others working in Widening Participation, especially for organisations carrying out their own research.

1.2 The Brilliant Club's programmes

The Brilliant Club runs two programmes. **The Scholars Programme** recruits PhD researchers, trains them as university access professionals and places them as tutors in schools to deliver academically rigorous programmes to small groups of high-potential pupils. **Researchers in Schools** recruits PhD graduates, places them as trainee teachers in schools and supports them to develop as excellent teachers and research leaders committed to closing the gap in attainment and university access.

The main way in which we go about understanding what is working in our programmes, and what we can do to improve them, is by evaluating key features of the programmes and assessing specific outcomes. Our methodological approach to this is detailed in this protocol and applies to both our programmes. For clarity, in this protocol, we describe how the methodology has been applied to The Scholars Programme, using examples from the internal research projects carried out on The Scholars Programme in 2016/17.

As an established intervention, The Scholars Programme already has a body of evidence that we can assess to identify what is working effectively and what could be improved. To guide our programme development, findings from the internal research projects are used to make incremental improvements; for example, to inform the implementation of new features in the redesigned programme, which was launched in September 2017.

1.3 Research and impact

The Brilliant Club's Research and Impact Department was established in January 2016 to help deliver the charity's new five-year strategy, [The Path to Outcomes](#), which focuses on delivering consistent and reliable outcomes for pupils. Our department brings together [five social scientists](#) who work to understand the impact of our work on pupil outcomes.

The type of research that the department carries out can be grouped into the three following strands, as shown in Table 1 below: 1) Internal Research Projects; 2) Research Collaboration Projects; and 3) External Evaluation Projects. This protocol, and the reports that follow in the series, will focus on the first strand: internal research projects. Findings from the other two strands will also be disseminated, either as published academic papers or as external reports.

Table 1. An overview of the Research and Evaluation strands

	Project Strand	Commentary
1. Internal Research Projects	Evaluation projects evidence the impact of our programme and identify the factors that relate to differential pupil outcomes.	Underpinning both our innovation and evaluation projects is a commitment to testing the assessment measures that we have chosen for evaluating pupil outcomes, see Section 3.3 for further details on our outcomes framework.
	Innovation projects evaluate the case for introducing new programme features.	
2. Research Collaboration Projects	We work collaboratively with our university partners to evaluate interventions that we think have the potential to help pupils progress to highly-selective universities.	Typically, these projects include a variant of one of our existing programmes, either as a single intervention or as part of a complex intervention, in which other programmes are also taking place.
3. External Research Projects	External research projects, independent of the Research and Impact Department, which enable us to validate findings from our internal research projects with greater statistical rigor and on a larger scale.	<p>In January 2017, The Brilliant Club commissioned the Universities and Colleges Application Service (UCAS) to evaluate the impact of The Scholars Programme on progression to highly-selective universities. Further information on this external evaluation project can be found here.</p> <p>We intend to commission another external evaluation project by summer 2018. We will work to ensure that the relevant data validity checks are in place for commencement in September 2018.</p>

2. Internal Research Projects

As an organisation we are committed to refining the delivery of our programmes to further improve pupil outcomes. We continually make small adjustments to the programmes based on feedback from pupils, parents, schools and our university partners. Most of our research projects focus on small adjustments to the programmes. We always inform schools about the research projects that involve introducing features that are significantly different from the typical programme models.

For all internal research projects, we make a distinction between ‘evaluation’ and ‘innovation’ projects. As outlined in Table 1, evaluation projects evidence the impact of our programmes and identify the factors that relate to differential pupil outcomes; innovation projects evaluate the case for introducing new programme features.

In the context of this report series, evaluation projects assessed pupil outcomes on the original version of The Scholars Programme (prior to September 2017), and innovation projects compare pupil outcomes between the original and the re-designed model (2017/18) to test the efficacy of the new programme features. This section provides a summary of the original and the re-designed programme. The subsequent section outlines the methodological approaches taken used in both evaluation and innovation projects.

Table 2 below outlines the key features that we are retaining from the original model. In the original model, pupils received a series of six university-style tutorials delivered by a PhD Tutor. They were also invited to attend two university trips with sessions on university Information, Advice and Guidance (IAG) and academic study skills. At the end of the programme, pupils submitted a final assignment and received one-to-one feedback on their assignment.

The re-designed programme contains three new assessment and programme features: 1) both the baseline and final assignments are marked using a standardised mark scheme; 2) pupils receive an additional seventh tutorial with one-to-one feedback on the draft of their final assignment; and 3) Key Stage 5 pupils are given additional IAG resources to help them with applying to universities. The following page is a schematic overview of the new programme model.

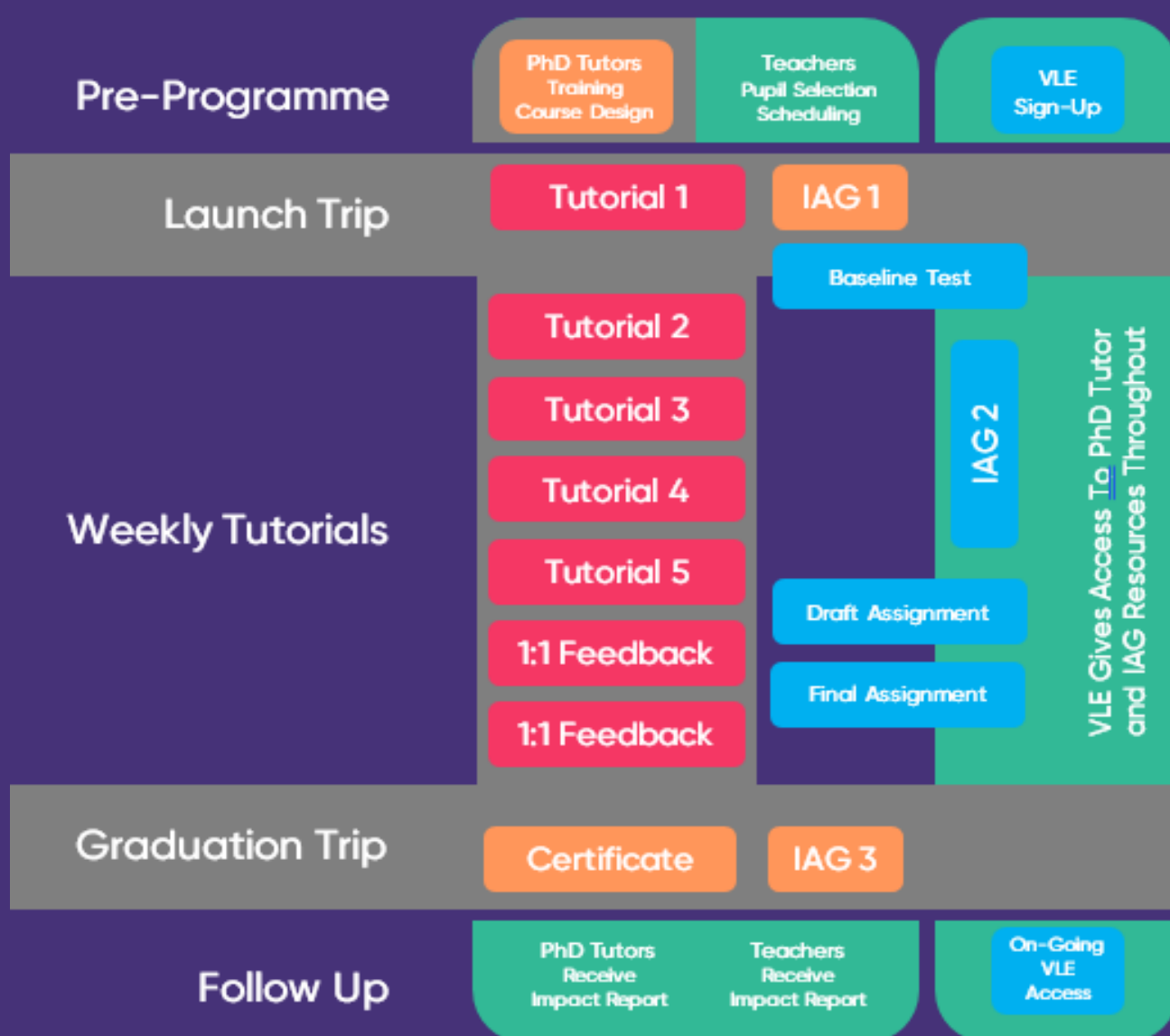
Table 2. Summary of the key features of The Scholars Programme

The Scholars Programme – Key Features
The Scholars Programme has a codified structure that has remained in place since the original pilot in 2011. The simplicity and replicability of the programme has been important in enabling it to work with pupils aged 10–18, and scale across all regions of England within the last five years.
We provide PhD tutors with a comprehensive training programme, designed and delivered by qualified teachers. This supports PhD tutors to develop their teaching, transferable and leadership skills.
PhD tutors work with groups of no more than six pupils, supporting them to develop the knowledge, skills and ambition needed to progress to highly-selective universities.
Each programme has an academic strand, including a series of university-style tutorials based on the research of the PhD Tutor and presented to pupils in a high-quality course handbook.
This strand also includes homework assignments and a final university-style assignment graded at one key stage above the pupils’ level. Pupils are given university-style marks, e.g. 1 st , 2:1, etc.
The programme also has a university access strand, including two trips to highly-selective universities, presentations from university staff and access to The Brilliant Club’s virtual learning environment (VLE).

New Programme Model: The Scholars Programme



The diagram below shows the basic building block of The Scholars Programme. Each programme is delivered over a three-month period, with the same structure applying at each key stage. PhD tutors deliver a series of tutorials based on their research, leading to a final assignment. As well as attending two university trips, pupils access IAG resources via our VLE, with a different theme for each key stage.



3. Methodology

In this section, we provide a 'bird's-eye view' of the different methodological approaches that we use in our internal research projects. These can vary depending on the purpose of the research, for example whether it follows the evaluation or innovation strand. The methodology also differs depending on the research question and practical considerations. To demonstrate how we use different methodological approaches in our research projects, we provide some examples of the research projects undertaken in 2016/17 in Section 4 (p.13).

3.1 Participants

The individuals taking part in The Scholars Programme are a sample of pupils from under-represented backgrounds who typically do not progress to highly-selective universities. Crucially, the sample should reflect the population of young people in the UK not represented in higher education. Under-representation is linked to socio-economic disadvantage, largely – though not exclusively – because lower socio-economic status is strongly associated with lower attainment at school.

A variety of criteria can be used to identify socio-economic disadvantage, including measures of household income, parental history of higher education, the income deprivation affecting children index (IDACI) and Participation of Local Areas (POLAR3) with low participation of young people in higher education. Research suggests that eligibility for free school meals during the past six years (Ever6FSM) is a good predictor of disadvantage, particularly because it has a clear link to attainment (Crawford & Greaves, 2013). The targeting criteria for The Scholars Programme include Pupil Premium (Ever6FSM), parental higher education and IDACI. For example, for the research projects undertaken in 2016/17, at least a third of pupils taking part in the programme were Ever6FSM pupils.

Sample size

The sample size for each research project needs to be large enough to have the statistical power to detect significant group differences. Typically, power calculations are run to establish this using statistical software, such as G*Power (Erdfelder, Faul, & Buchner, 1996). Where possible, we aim to run power calculations to determine the appropriate sample size for our research projects. However, this was not possible for the research projects conducted in 2016/17, as we did not have any prior data which we could use to predict the expected group differences. Instead, we looked at the research literature to determine what would be an appropriate sample size given the nature and design of each research project. For each of these research projects, we aimed to recruit between 105 and 232 pupils. This sample size allowed for an estimated attrition rate of 20% of pupils to account for any missing data points or pupils who did not complete the programme.

3.2 Design

Both evaluation and innovation projects use pre- and post-test (repeated measures) design to evaluate pupil outcomes. Evaluation projects assess pupil progress, and are conducted without a control group. Innovation projects assess the 'added value' of new programme features on pupil outcomes, and are carried out with a control group. Evaluation of new assessment measures can be either with or without a control group, depending on the context. The section below outlines how the design of the two project types differ.

3.2.1 Evaluation projects: Pre- post- test without a control group

Individuals are assessed at the beginning (pre-test) and at the end (post-test) of the intervention (Figure 1). A pre- post-test design is adopted for evaluation projects, as these projects analyse the level of within-subject change for a specified outcome(s), following an intervention – for example, this approach was taken to assess the impact of The Scholars Programme on pupils' verbal communication skills (see Section 4, project 3).



Figure 1. A schematic of the evaluation projects design

3.2.2 Innovation projects: Pre- post- test with a control group

Individuals are assigned to either an intervention group or a control group, and both groups receive a pre-test and a post-test (Figure 2) – for example, this approach was taken to assess the added value of introducing an additional tutorial to The Scholars Programme (Section 4, project 6).

Intervention group: The intervention group receives a new variant of the original model of The Scholars Programme, with a new programme feature.

Control group: There are two types of control groups: 1) a control group who do not receive any intervention, sometimes referred to as 'business as usual' – in our context, this refers to pupils not taking part in The Scholars Programme and just attending school as normal; or 2) a control group who receive an alternate intervention or matched activities, sometimes referred to as an 'active control group'. For the purposes of the innovation projects we use the latter type of control group.

Group allocation: Assignment of the schools to the intervention and control group is at random, where possible. We do not randomly assign pupils within schools' due to the risk of contamination across groups. Contamination is when pupils in the intervention group share information about the intervention with pupils in the control group.

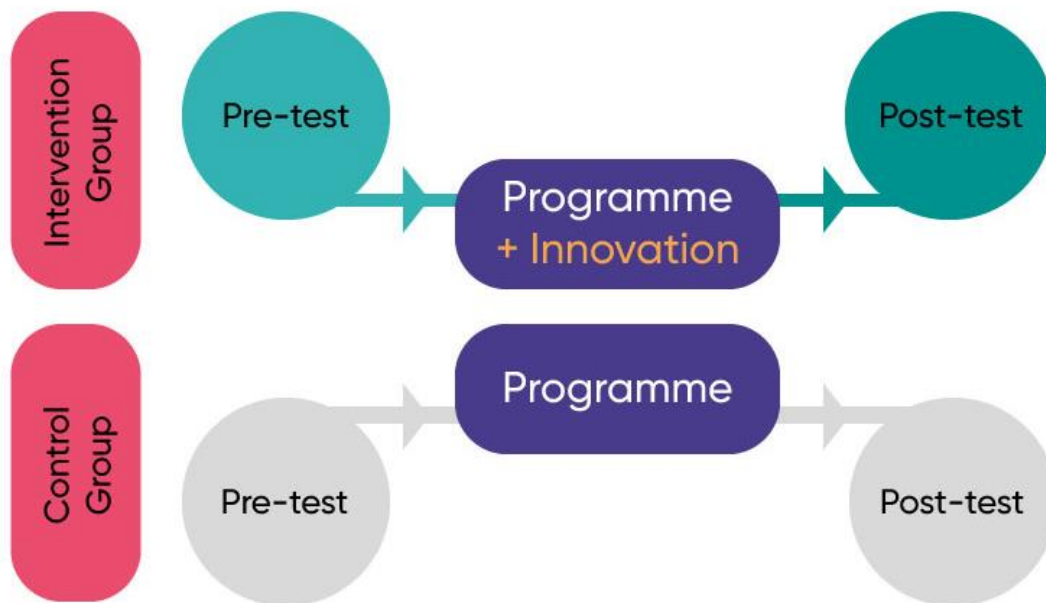


Figure 2. A schematic of the innovation projects design

Having a control group provides a counterfactual of what would happen if the intervention did not take place. This type of design has not been possible for the evaluation projects conducted to date, as this would have involved tracking a group of pupils who were not taking part in The Scholars Programme. Thus, this type of design would only have been possible with an external evaluator, or with a waitlist cohort that had been selected but had not yet been enrolled onto the programme.

For some innovation projects, random allocation of schools to groups may not be possible due to practical constraints – for example, if not all schools that are allocated to the intervention group can attend the same Launch Trip where a component of the intervention is taking place. In these instances, we allocate schools to either the intervention or control groups based on the Launch Trips that they can attend, we then check to ensure that the schools selected for the intervention and control groups are similar on key variables that are associated with pupil outcomes (Figure 3).

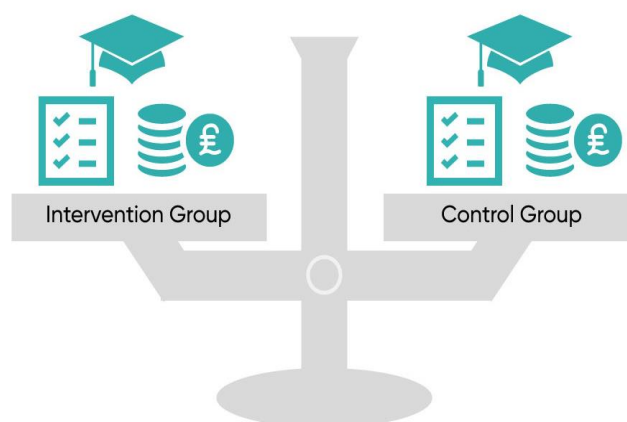


Figure 3. Schools from the intervention and control groups are matched on three characteristics: 1) proportion of Ever6FSM pupils or those eligible for Pupil Premium; 2) Ofsted school ratings; 3) percentage of pupils achieving 5A*-C GCSEs.

3.3 Measures

Both evaluation and innovation projects evaluate a specified outcome (outcome evaluation), and the practical aspect of programme delivery (process evaluation). The former is needed to know which specific measure of pupil outcome the programme is impacting on, and the latter is necessary for effective implementation of the assessments or new programme features. This section summaries the outcome measures and assessment tools that we use for outcome and process evaluation in our research projects.

Outcome evaluation

Based on academic literature, we have identified six competencies that have been shown to be important for progressing to highly-selective university (Table 3). The competencies are built upon a series of cognitive and non-cognitive skills that the research shows as having a positive impact on academic attainment, as well as life outcomes more widely.

Cognitive skills are those which relate to mental processes such as remembering and reasoning (ACT WorkKeys, 2014). These skills are typically assessed in the context of literacy and numeracy. Non-cognitive skills focus on the attitudes, strategies and behavioural tendencies that facilitate academic achievement (Gutman & Schoon, 2013). Research shows that non-cognitive skills are particularly important for helping to close the attainment gap for pupils from under-represented backgrounds (Gutman & Schoon, 2013; Heckman, Stixrud, & Urzua, 2006).

The six competencies form the specified outcome(s) that we measure in our research projects. Examples of the assessment tools that we use for outcome evaluation include: 1) pupil self-report assessments; 2) multiple-choice questions; and 3) extended written assignments.

Table 3. Definitions of the six competencies that our programmes assess

Competencies	Definitions
Written and Verbal Communication	The ability to use written information or spoken language clearly and appropriately to convey ideas.
Subject Knowledge	Having a deep-level of understanding on the topics studied in The Scholars Programme and Researchers in Schools.
University Knowledge	New knowledge about university options and how to successfully apply to study at university in Year 13.
Motivation and Self-Efficacy	Motivation refers to what causes an individual to want to do one thing and not another (intrinsic motivation). Self-efficacy measures pupils' belief in their ability to achieve future goals or influence future situations.
Meta-Cognition	The ability to think explicitly about one's own learning.
Critical Thinking	The ability to analyse and evaluate a subject objectively to form a judgement.

Process evaluation

A process evaluation is conducted at the end of each project to serve three purposes: 1) to determine if the programme is implemented in the most effective way; 2) to come up with solutions for addressing any risks and challenges associated with the delivery of the programme; and 3) to determine whether and how the intervention can be taken to scale. The results from the process evaluation are then fed into the next phase of programme development. These are either used to make specific alternations to the programme as it currently stands, or are used for implementing specific measures for evaluating the programme for large-scale roll out. Examples of assessment tools for process evaluation include: 1) focus group and interviews and 2) post-programme surveys.

3.4 Analysis

The data for each individual project are analysed using standard statistical packages SPSS (IBM Corp., 2013) or STATA (StataCorp., 2011) to identify statistical significance ($p < 0.05$) for within-subject and between-subject group comparisons. The p -value determines whether the effect could have occurred by chance. Where appropriate, Cohen's d effect sizes are also reported alongside significance level. Effect sizes indicate the standardised difference between two groups without the confounding effect of sample size.

For evaluation projects, we analyse the within-subject pre- and post- test difference scores using paired sample t -tests. Pre-analysis steps are run to ensure that the statistical assumptions for within-subject parametric tests are met. Outliers are only excluded if there is a clear reason to do so, otherwise non-parametric tests are used (e.g. Wilcoxon Signed Rank Test). If the data do not follow a normal distribution, we either transform the data to normal or analyse the data using non-parametric tests.

For innovation projects, we draw comparisons between the intervention and control group on a single measure using independent sample t -tests or logic regressions. The same pre-analysis steps are applied as above to ensure that the data are normally distributed and the data from multiple groups have the same variance (homogeneity of variance).

For both types of research projects, we analyse and report on the overall average score of the assessment measures, calculated by averaging all individual item scores. If applicable, subscale scores are also analysed, computed by averaging selective item scores. In projects where the pre- and post- test scores are obtained, the change scores (difference between the pre- and the post- tests) are analysed.

For analyses of data that are drawn from two timepoints and comparing between two groups, we include only participants with complete data from both timepoints, and run independent sample t -tests on the change scores. A repeated measures ANOVA is used to analyse group differences of three or more groups with data that are drawn from more than two timepoints.

Additional subgroup analyses are performed to understand whether the effects vary by pupil characteristics such as age, gender, Ever6FSM. Where appropriate, correlation analyses are carried out to understand the relationship between pre- and post-test data, between subscales within a measure, or to determine the inter-rater agreement on a specific measure(s).

4. Overview of Internal Research Projects 2016/17

The table below provides an overview of the evaluation and innovation projects undertaken in 2016 /17. Details of the methodology and results can be found in the subsequent reports in this series.

	Projects	Research Questions	Intervention/ Methodology	Outcomes
Evaluation	1. Academic Writing Skills	Can we use a standardised mark scheme to assess pupils' progress in academic writing skills?	The original Scholars Programme / Pre- post- tests without a control group	To evaluate the impact of The Scholars Programme on written communication, critical thinking and subject knowledge; and to test the feasibility of applying a standardised mark scheme across a range of subjects
	2. Motivation and Pupil Satisfaction	Does motivation or pupil satisfaction in school relate to programme completion and final assignment performance?	The original Scholars Programme / Pre- post- tests without a control group	To establish whether pupil motivation or satisfaction in school measured at the beginning of the programme is related to programme completion and final assignment performance
	3. Verbal Communication	What is the impact of The Scholars Programme on pupils' verbal communication?	The original Scholars Programme / Pre- post- tests without a control group	To assess the verbal communication measures chosen and the feasibility of applying this measure in the context of The Scholars Programme
Innovation	4. Introducing a Seventh Tutorial	Does including an additional tutorial to The Scholars Programme increase pupil performance?	The Scholars Programme with an additional tutorial for one-to-one feedback / Pre- post- tests with a control group	To establish whether an additional tutorial would increase final assignment performance
	5. Embedding Multiple-Choice Questions	Does weekly retrieval practice through multiple-choice tests improve subject knowledge and programme performance?	The Scholars Programme with weekly multiple-choice tests / Pre- post- tests with a control group	To establish whether embedding weekly multiple-choice questions on subject knowledge affects final assignment performance
	6. Additional Information, Advice and Guidance (IAG) Resources for Key Stage 5 Pupils	Does completion of an online module of IAG lead to an increase in pupils' knowledge about university?	The Scholars Programme with additional IAG resources for Y12 pupils / Pre- post- tests with a control group	To develop a multiple-choice test which measures pupils' university knowledge and to establish whether an online module of IAG impacts on pupils' knowledge about university

5. Conclusions and Next Steps

In pursuit of our mission to deliver consistent and reliable outcomes to drive pupil outcomes, we conduct a series of internal research projects to systematically evaluate the impact of our programmes in greater detail. The project design and analysis approaches outlined in this report take into account the practical constraints of the programme, while retaining the rigor and consistency needed for systematic evaluation. As we continue to develop our programmes, each new programme feature will be tested to inform its efficacy prior to implementation and large-scale roll out. The outcomes of each research project form only part of an ongoing and iterative process, through which we seek to continually enhance our understanding to improve our programmes' impact.

6. Bibliography

- ACT WorkKeys. (2014). *Cognitive and noncognitive skills*. Retrieved from <http://www.act.org/content/dam/act/unsecured/documents/WK-Brief-KeyFacts-CognitiveandNoncognitiveSkills.pdf>
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences (2nd ed)*. Hillsdale, HJ: Lawrence Earlbaum Associates.
- Crawford, C., & Greaves, E. (2013). *A comparison of commonly used socioeconomic indicators their relationship to educational disadvantage and relevance to teach first*. London: Inst. of Fiscal Studies. Retrieved from <http://dx.medra.org/10.1920/re.ifs.2013.0079>
- Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior Research Methods, Instruments, & Computers*, 28(1), 1–11. <https://doi.org/10.3758/BF03203630>
- Gutman, L. M., & Schoon, I. (2013). The impact of non-cognitive skills on outcomes for young people. *Education Empowerment Foundations, London*. Retrieved from https://v1.educationendowmentfoundation.org.uk/uploads/pdf/Non-cognitive_skills_literature_review_1.pdf
- Heckman, J. J., Stixrud, J., & Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics*, 24(3), 411–482.
- IBM Corp. (2013, Released). IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
- StataCorp. (2011). *Stata Statistical Software: Release 12*. College Stataion, TX: StataCorp LP.

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