TASO Transforming Access and Student Outcomes in Higher Education

Final analysis report: Institutional Data use: University of Huddersfield - Score As I Learn (SAIL)

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This study was pre-registered on OSF registries: https://osf.io/3cfsh

Table of contents

1. Summary 4

2. Introduction 6

2.1. Background 6

2.2. Aims 7

2.3. Intervention 8

3. Methods 9

3.1. Design 9

3.2. Identification strategy 9

3.3. Outcome measures 9

3.4. Sample selection 11

3.5 Analytical strategy 11

3.6 Model diagnostics and design 12

4. Results 15

4.1. Participant flow 15

4.2. Description of data 15

4.3. Outcome of analysis 17

4.4. Deviation from analysis protocol 22

5. Discussion 22

5.1. Generalisability 23

5.2. Limitations 23

5.3. Conclusion 23

6. Appendices 25

6.1. Appendix A. Research question 1: Does SAIL impact students' engagement on their course? LMM outputs 25

6.2. Appendix B. Research Question 2: Does SAIL impact students' degree outcomes on their course? LMM outputs 26

6.3. Appendix C. Research Question 3: Does SAIL differentially impact BTEC+ and international students' grades depending on their qualifications on entry to the university or home/international status? LMM outputs 27

6.4. Appendix D. Research Question 5: Does engagement with SAIL impact grades for engineering students? LMM outputs 28

6.5. Appendix E. Research Question 6: Does participation in SAIL impact students' continuation? Logistic regression output 30

6.6. Appendix F. Impact Table 30

1. Summary

Background:

Staffordshire University were commissioned by the Centre for Transforming Access and Student Outcomes in Higher Education (TASO) to act as an independent evaluator of four post-entry interventions to address inequalities in student outcomes using institutional data and quasi-experimental designs. This report corresponds to the evaluation conducted for the University of Huddersfield's Score As I Learn (SAIL) programme.

Aims:

To explore whether SAIL has an impact on students' attendance and marks overall, and particularly for international students and students entering University of Huddersfield with non A-level qualifications (BTEC+).

Intervention:

SAIL is a universal intervention for all Engineering students at the University of Huddersfield. The programme is designed to support students entering university who may be unaware of the self-study expectations or have the associated habits. A nominally summative assessment encourages students to engage with the module weekly, without these assessments impacting overly on overall grades. Each module in all academic years has 11 weekly assessments each of which are each weighted at 3% of the module mark. These low stakes, but nonetheless summative, assessments are typically multiple-choice question quizzes, delivered through the University's Virtual Learning Environment (VLE). Students can choose to complete any number of the weekly quizzes, including none at all. The best 8 out of the 11 weekly task marks count towards the final module mark. This means that 24% of the total module mark comes from SAIL low-stakes assessments.

Design:

This evaluation was a quasi-experimental design using available institutional data. The comparator group was students from the same academic school who had not been part of the SAIL programme (Computing students). These courses were selected as they are similar in structure. To control for variance between the groups that is not a result of SAIL, statistical analyses controlled for covarying factors to increase the likelihood that observed effects could be attributed to SAIL.

Outcome measures:

The two primary outcome measures available were weekly attendance (percentage of timetabled sessions attended each week) and end of year grade (weighted average

module marks for each academic year). Secondary outcome measures included final year grade, module grade, and continuation.

Analyses:

Linear mixed models, multiple linear regression analyses, and logistic regression analyses were conducted to answer the research questions for this evaluation.

Results:

After controlling for all covarying factors, SAIL did not have an overarching impact on students' attendance at timetabled sessions, or on students' level grades. There was also no benefit on BTEC+ or international students' specifically, although A-Level SAIL students may have seen some benefit of the programme. However, amongst students who submitted at least eight SAIL assessments there was a strong, positive relationship between module grade and the number of SAIL assessments submitted.

Conclusions:

SAIL does not appear to affect students' attendance or grades. However, students who engage more in the programme are awarded higher grades. There are likely multiple reasons why students do or do not engage with the SAIL programme, however we encourage future research to explore these reasons and to facilitate students in engaging in their academic studies. We cautiously conclude that SAIL has a beneficial effect on the academic attainment of students who actively participate in the process.

2. Introduction

2.1. Background

This project was a collaboration between the Centre for Transforming Access and Student Outcomes in Higher Education (TASO), University of Huddersfield and Staffordshire University to support the use of institutional data to implement an evaluation which delivers Type 3 evidence. Between November 2023 and March 2024:

- workshops were held to develop an enhanced theory of change
- ethical clearance was agreed
- a prespecified trial protocol was developed and quality assured
- data were cleaned and analyses undertaken
- the final report was completed.

The team from University of Huddersfield was responsible for

- hosting and participating in the enhanced theory of change workshop
- achieving ethical clearance
- the provision of anonymised data
- the provision of anonymised data

The team from Staffordshire University was responsible for

- designing and facilitating the enhanced theory of change workshop
- completing the trial protocol
- data cleaning and analyses
- completing the final impact evaluation report.

Table 1 details the project team and their roles and responsibilities.

Table 1. Personnel involved in the project

Organisation	Name	Role and responsibilities
TASO	Dr Rob Summers	Project/Contract Manager
TASO	Luke Arundel	Project Assistant
Staffordshire University	Dr Sally Andrews	Project Lead. Responsible for day-to-day management of the project.

Staffordshire University	Vanessa Dodd	Project Co-lead. Responsible for supporting day-to-day management of the project.
Staffordshire University	Juan Raman Mullor	General project support. Report writing and interpretation.
Staffordshire University	Reagon Alford	Research Assistant. Responsible for data cleaning, analysis, and reporting.
Staffordshire University	Sehrish Ghayas	Research Assistant. Responsible for data cleaning, analysis, and reporting.
University of Huddersfield	Dr Jarek Bryk	Project Lead at University of Huddersfield. Responsible for data curation and distribution and supporting with exploratory analyses.
University of Huddersfield	Steve Bentley	Strategic Learning Technology Advisor at the University of Huddersfield. Responsible for VLE data collection and curation.
University of Huddersfield	Dr Keith McCabe	Head of Planning and Business Intelligence at the University of Huddersfield. Responsible for student demographic and attainment data.

2.2. Aims

The aim of this evaluation is to determine the effectiveness of the Score as I Learn (SAIL) initiative at the University of Huddersfield. SAIL's major aim is to increase student engagement, and ultimately course and module outcomes by introducing weekly 'low-stakes' summative assessments into modules throughout the student journey. This evaluation is being undertaken to develop the evidence base for the effectiveness of this initiative to support students' engagement and attainment at the University of Huddersfield. The evaluation will meet these aims via robust, inferential statistical techniques so the evaluators can infer causation. In this impact evaluation we will test the following research questions (RQs):

RQ1: Does SAIL impact students' engagement on their course?

H_0: students on courses with SAIL engage with their course to the same extent as students on non-SAIL courses.

H_1: students on SAIL courses engage with their course to a different extent than those on non-SAIL courses.

RQ2: Does SAIL impact students' degree outcomes on their course?

H_0: there is no difference in degree outcomes between students on SAIL courses compared to non-SAIL courses.

H_1: students on courses with SAIL have different degree outcomes than students on non-SAIL courses.

RQ3: Does SAIL differentially impact BTEC+ and international students' grades depending on their qualifications on entry to the university or home/international status?

H_0: there is no difference in grades for BTEC+ and international students on SAIL courses compared to non-SAIL courses.

H_1: BTEC+ and international students on SAIL courses will be awarded different grades to those on non-SAIL courses.

RQ4: Does engagement with SAIL impact on students' assessment submission habits?

H_0: there is no difference in substantive assessment submission habits between students on SAIL and non-SAIL courses.

H_1: the timing of substantive summative assessment submissions is different for students on SAIL courses relative to students on non-SAIL courses.

RQ5: Does engagement with SAIL impact grades for engineering students?

H_0: there is no difference in the grades of students who engaged in SAIL courses compared to the student who didn't engage in SAIL courses.

H_1: The students on SAIL will have different grades than those who didn't engage with SAIL course.

RQ6: Does participation in SAIL impact students' continuation?

H_0: Participation in SAIL has no impact on continuation?

H_1: Participation in SAIL has an impact on continuation?

2.3. Intervention

In SAIL, each of 11 weekly assessments is weighted at 3% of the module mark. The tasks are typically multiple-choice question quizzes, delivered through the University's Virtual Learning Environment (VLE). Each week, a quiz related to that week's content (in-person lectures and other materials released through the VLE) is released and students have one week to complete it. They only have one attempt to complete it, but their time for completion is not limited other than with the weekly deadline. Students are able to work collaboratively on the SAIL tasks and are able to leave the assessment and return later. Every module has a question bank, from which questions are randomly drawn for each student. Through the VLE, automatic feedback and quiz results are

released 24 hours after the passing of the weekly deadline. Students can choose to complete any number of the weekly quizzes, including none at all.

Crucially, as the SAIL task submission deadline cannot be extended and resubmission is not permitted even in cases of extenuating circumstances, only the best 8 out of the 11 weekly tasks marks count towards the final component mark. This means that 24% of the total module mark comes from SAIL low-stakes assessments. Submission of SAIL assessments is non-compulsory, but the SAIL contribution remains calculated from the maximum of 8, where non-submissions contribute as a 0% grade.

This regular self-checking exercise also presents an opportunity for academic staff to monitor student and class performance and adapt classroom content based on the outcomes of the whole cohort.

3. Methods

3.1. Design

This study will merge administrative institutional data with localised SAIL engagement data from the School of Computing and Engineering at the University of Huddersfield. Data are collated from records collected from 2021-22 and 2022-23 academic years.

The independent evaluators had no influence on determining the eligibility, group-allocation, or selection criteria of students to the SAIL programme, nor collection of data.

3.2. Identification strategy

As Academic schools each have distinct cultures and themes, the students used within these analyses were all selected from the School of Computing and Engineering. The intervention was introduced to all students studying in the Engineering department, so comparator students were selected from the Computing department. These departments are comparative in subject discipline nature and the style of teaching, learning, and assessment.

To control for variance in attainment and attendance that is not attributable to SAIL, covariates outlined in Table 6 will be used within each statistical analysis.

3.3. Outcome measures

Table 2 outlines the primary and secondary measures that will be used within the analyses to address the hypotheses in Section 3. The primary outcome refers to the core aim of SAIL, to increase course engagement. The secondary outcomes refer to those outcomes that are hypothesised to result from increased course engagement and are secondary benefits of SAIL.

Table 2. Outcome Measures

Outcome measure	Data to be collected	Point of collection	Change to protocol
Weekly attendance	Mean average of attendance to lectures, seminars and workshops on their undergraduate degree	Real time data which will be collected in relation to specific cut off criteria	No change.
Degree classifications	Final grade given to students at the end of their degree (Fail, 3rd, 2:2, 2:1, 1st)	Administrative data collected routinely	Received, however as these data only exist for a small proportion of students – those on 3-year courses who were in level 5 or level 6 in 2021-22, or those on 3-year courses who were in level 6 in 2022-23 – level 6 grade was calculated as a proxy for degree outcome (see below).
Final year grade	Grade at the end of their final year of study	Administrative data collected routinely	This was calculated from the weighted mean (by module credits) of final year module grades for students who had completed 120 credits (full year).
Assessment submission time	Difference between students' substantive assessment submission time and the original deadline in minutes	Administrative data collected routinely through the VLE	These data were not available.
Module grade	The grade a student received for each module studies	Administrative data collected routinely	No change.
Continuation	Whether students progress to the next year of study or graduation	Administrative data collected routinely	These data were not available and so were inferred by exploring whether students who

			were level 4 or level 5 in 2021-22 had progressed to their next level in 2022-23.

3.4. Sample selection

This evaluation will use secondary data from students who were current students or graduates of University of Huddersfield between 2021-22 and 2022-23. The institution has previously gathered this data for various purposes, potentially utilising it for institutional metrics. Nevertheless, researchers have not previously examined or accessed this specific dataset, making it suitable for pre-registration purposes.

Table 3. Split of student sample between academic years

Academic Year	Non-SAIL (n)	SAIL (n)
2021-22	823	462
2022-23	830	328

Appropriate student demographics information, learning analytics, and assessment data was available for 1867 unique students across the two academic years and the two academic departments. Table 3 shows the split of SAIL and Non-SAIL students in the 2021-22 and 2022-23 academic years. These students spanned all academic years (see Table 5 for further breakdown). Some students appear in multiple academic years – and therefore also multiple programme years.

3.5 Analytical strategy

We are using a comparator department instead of exploring changes in student attendance and grades before and after SAIL was introduced. The reason for this is that institutional data was not available for the period prior to the introduction of SAIL, ruling out a differences-in-differences design. As SAIL is a universal programme across all Engineering students, it is also not possible to generate a comparator group from the same academic programme. As such, the analytical strategy will use Linear Mixed Model (LMM) analyses to address RQ1 – RQ5. In LMM, fixed effects are used to explore the effect of variables of interest on outcome variables of interest. In this case our fixed effects are SAIL (whether students were studying on a SAIL course) and the following covariates: students' age, gender, IMD quintile, ethnicity, level of study, and UCAS points. However, as students are not randomly allocated to treatment groups,

there is non-independence with the fixed effects. Random error accounts for this unobserved variance that affects certain groups in the data. Nested and Crossed random effects are used to account for the hierarchical structure of the data. This accounts for the variance related to differences in courses, modules and students, where the same students are represented multiple times in the data.

The outcome variable for RQ6 is a binary variable (continuation; whether students continue to the next level of study). Logistic regression will therefore be used to address this question.

3.6 Model diagnostics and design

As the data are hierarchical in structure, LMM is appropriate for these analyses. This allows random effects to be captured and accounted for within the model, which affords greater confidence when attributing any effects to SAIL.

The following designs will be used to address each research question:

RQ1: Does SAIL impact students' engagement on their course?

$$Y_{ij} = \beta_0 + \beta_1 * SAIL_{ij} + \beta_2 * X_{ij} + Z_j * y_j + \in_{ij}$$

where:

- Y_{ij} as the engagement score for the i-th student in the j-th course
- $SAIL_{ij}$ as a binary variable indicating whether the SAIL approach is implemented for the i-th student in the j-th course
- X_{ij} as a vector of control variables that might influence engagement
- y_j as a vector of course-specific random intercepts
- β_0 is the fixed intercept
- β_1 is the coefficient for SAIL, representing the average change in engagement due to SAIL
- β_2 is a vector of coefficients for the control variables (see Table 3)
- Z_j represents the nested random effects (student ID nested by course ID)
- $\in_{ij}$ is the error term

RQ2: Does SAIL impact students' degree outcomes on their course?

$$Y_{ij} = \beta_0 + \beta_1 * SAIL_{ij} + \beta_2 * X_{ij} + Z_j * y_j + \in_{ij}$$

where:

- Y_{ij} as the degree outcome score for the i-th student in the j-th course
- $SAIL_{ij}$ as a binary variable indicating whether the SAIL approach is implemented for the i-th student in the j-th course
- X_{ij} as a vector of control variables (see Table 3) that might influence degree outcomes
- y_j as a vector of course-specific random intercepts
- β_0 is the fixed intercept,
- β_1 is the coefficient for SAIL, representing the average change in degree outcome due to SAIL
- β_2 is a vector of coefficients for the control variables (see Table 3)
- Z_j represents the nested random effects (student ID nested by course ID)
- $\in_{ij}$ is the error term

RQ3: Does SAIL differentially impact BTEC+ and international students' grades, relative to those with A-Level qualifications?

$$Y_{ijk} = \beta_0 + \beta_1 * SAIL_{ijk} + \beta_2 * BTEC_{ijk} + \beta_3 * International_{ijk} + \beta_4 * Alevel_{ijk} + \beta_5 * SAIL_{ijk} * BTEC_{ijk} + \beta_6 * SAIL_{ijk} * International_{ijk} + \beta_7 * X_{ij} + y_{0k} + y_{1k} * BTEC_{ijk} + y_{2k} * International_{ijk} + \in_{ijk}$$

Where:

- Y_{ijk} is the grade for the i-th student in the j-th qualification group (BTEC+, International, A-Level) in the k-th course
- $SAIL_{ijk}$, $BTEC_{ijk}$, and $International_{ijk}$ are binary variables indicating whether the SAIL approach is implemented, whether the student has a BTEC+ qualification, and whether the student is an international student, respectively
- β_0 is the fixed intercept,
- β_1 through β_6 are the coefficients of the fixed effects representing the average impact of SAIL, BTEC+, International, and their interactions on grades
- X_{ij} is a vector of control variables (see Table 3) that might students' grades
- β_7 is a vector of coefficients for the control variables
- y_{0k} represents the nested random effects (student ID nested by course ID)
- $\in_{ijk}$ is the error term

- Interaction terms in the model ($\beta_5 * SAIL_{ijk} * BTEC_{ijk}$, $\beta_6 * SAIL_{ijk} * International_{ijk}$) allow you to examine whether the impact of SAIL differs for BTEC+ and international students compared to A-Level students
- y_{1k} and y_{2k} capture course-specific variations (i.e. module and student effects)

RQ4: Does engagement with SAIL impact on students' assessment submission habits?

This research question could not be answered due to lack of assessment submission data.

RQ5: Does engagement with SAIL impact grades for engineering students?

$$Y_{ij} = \beta_0 + \beta_1 * X_1(SAILEngagement_{ij}) + \beta_2 * X_{ij} + Z_j + \epsilon_{ij}$$

- β_0 is the intercept
- Y_{ij} is the module grade for the i-th student in the j-th
- X_1 is an independent variable that represents the number of SAIL assessments submitted
- X_{ij} is a vector of control variables (see Table 3) that might influence students' overall grade
- Z_j represents the crossed random effects (Module ID and Student ID)
- $s\epsilon_{ij}$ is the error term

RQ6: Does participation in SAIL impact students' continuation from Level 4 to Level 5 and Level 5 to Level 6?

$$Y_{ij} = \beta_0 + \beta_1 * X_1(SAILParticipation_{ij}) + \beta 2 * X_{ij} + \epsilon_{ij}$$

- β_0 is the intercept
- $Y_{ij}$is the continuation status for the i-th student in the j-th course.
- $X_1$is a binary variable that represents if a student participated in a SAIL course
- X_{ij}as a vector of control variables (see Table 3) that might influence continuation
- ϵ_{ij} is the error term

Table 4. Covariates to be used

Covariate name	Type	Levels	Change to protocol

UCAS points	Continuous	UCAS points	No change
Programme mode	Categorical	Full-time, Part-time	Not received
Programme year	Categorical	Block 1, 2, 3, 4, 5	No change
Commuter status	Categorical	Commuter, Not Commuter	Not received
IMD	Categorical	Quintile 1, Quintile 2, Quintile 3, Quintile 4, Quintile 5	No change
Gender	Categorical	Male, Female, Non-binary, Other	No change
Age	Categorical	Young, Mature	Age in years calculated from HESA birthdate
Ethnicity	Categorical	White, BAME[1], Unknown	No change
Disability	Categorical	Disability declared, No disability declared	No change
Care leaver	Categorical	Care leaver, Not care leaver	Not received

4. Results

4.1. Participant flow

The analysis is conducted using secondary data on 1867 students at the University of Huddersfield for academic years 2021-22 and 2022-2023. These data were a combination of student demographic, module grade, and average weekly attendance data. The two groups of students are taken from the School of Computing and Engineering; Engineering students (n = 632) participated in SAIL while Computing students (n = 1235) are taken as a control group.

4.2. Description of data

Table 4 shows the split of SAIL and Non-SAIL students in the 2021-22 and 2022-23 academic years. These students spanned all academic years. Some students appear in multiple academic years – and therefore also multiple programme years.

Table 4. Sample Size for analysis

Table 5 shows the number of students included in each covariate that was controlled for within the models.

[1] Black, Asian, and Minority Ethnic. We recognise that this term can mask disparities between heterogeneous ethnic groups, who have discrete barriers to opportunity. We use it here as it was the grouping identified in the Theory of Change model for the SAIL programme.

Table 5. Summary Statistics for Categorical Variables

	SAIL (n)	Non-SAIL (n)
Total	**632**	**1235**
Gender		
Female	53	171
Male	579	1054
Unknown	0	10
Disability		
Disability	64	167
Non-Disability	574	1086
Ethnicity		
White	200	603
BAME	209	395
Unknown	227	252
Student Type		
Home	414	1006
International	218	229
Qualification Type		
A-level	184	337
BTEC+	171	477
Other Qualification	283	446
IMD Quintile		
IMD 1-2	246	583
IMD 3-5	165	411
IMD unavailable	221	241
Programme Year		
Year 1	279	610
Year 2	219	487
Year 3	244	139
Year 4	309	408
Year 5	20	7

Overall, there are more non-SAIL students than SAIL students. The majority of students are male and report not having a disability, however there is a greater diversity of other demographic characteristics, with a spread of student deprivation (as indicated by the English Index of Multiple Deprivation; IMD), entry qualification types, and of ethnic backgrounds. Note that we have not split by granular ethnic background as this did not form part of the Theory of Change for SAIL. One-fifth of the population were international students.

4.3. Outcome of analysis

Table 6 summarises the effects for all research questions addressed through this evaluation, which are explored further below.

Table 6. Summary outcomes for all research questions.

Outcome	Mean for Non-SAIL	Estimated Effect	SE	p-value	Interpretation
Linear Mixed Model Results					
RQ1: Weekly Attendance	67.82%	2.14	1.33	.182	There was no significant difference in attendance for SAIL and non-SAIL students.
RQ2: Final year grade	63.57%	3.40	2.48	.365	There was no significant difference in module grades between SAIL and non-SAIL students.
RQ3: End of year grades for BTEC+	61.90%	-4.57	1.37	.008	SAIL BTEC+ students had significantly lower grades than SAIL A-Level students.
RQ3: End of year grades for International	64.61%	-1.61	6.86	.857	There was no significant difference in module grades for SAIL and non-SAIL international students.
RQ5: Module grades by SAIL assessments	53.57%	1.87	1.98	<.001	Students who submit more SAIL assessments received significantly higher grades. Module grades increase by approximately 1.87% for each additional SAIL assessment submitted over the threshold of eight
Logistic Regression Results					
RQ6: Continuation	92.8%	.40	.21	.056	SAIL students are no more likely to continue on their course than non-SAIL students.

RQ1: Does SAIL impact students' engagement on their course?

Results suggest that there was no difference in attendance between SAIL and non-SAIL students after accounting for variance from other contributing factors, with BAME, BTEC+, IMD Q1-2, mature, and lower UCAS point students having significantly lower attendance than White, A-Level, IMD Q3-5, young, and higher UCAS points students respectively

(see Table A1 for model statistics). Figure 1 shows the weekly attendance for SAIL and Non-SAIL students with 95% confidence intervals, after accounting for these contributing factors.

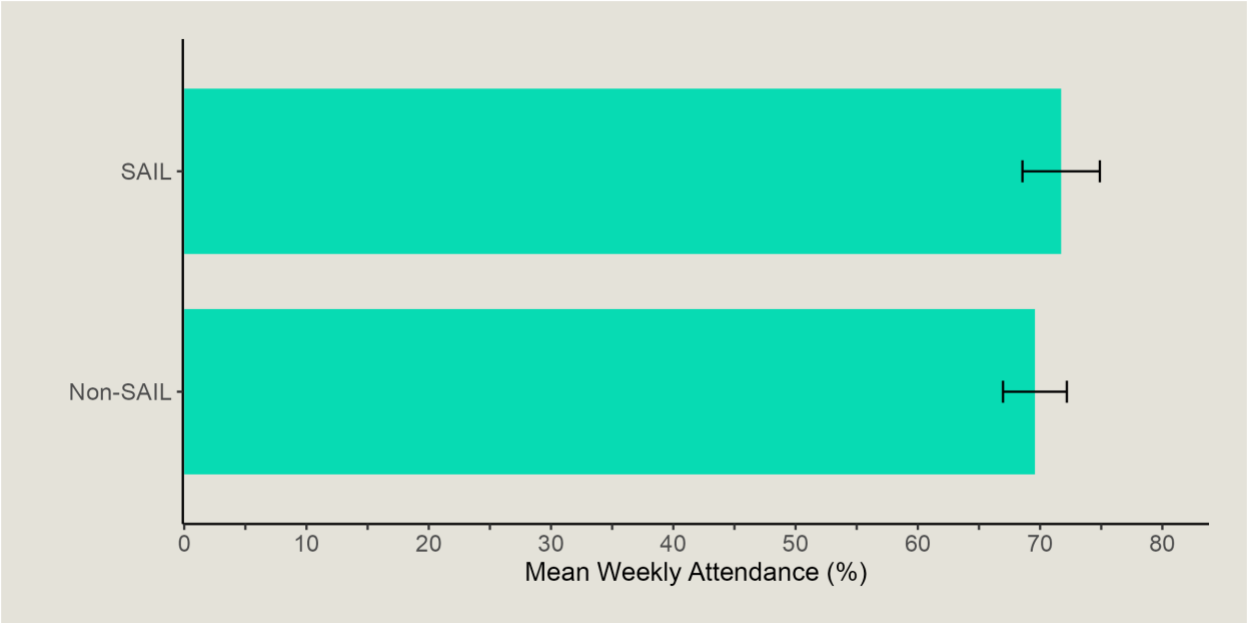

Figure 1. Mean Attendance for SAIL and non-SAIL students (error bars show 95% confidence intervals)

RQ2: Does SAIL impact students' degree outcomes on their course?

Results from this model suggest that SAIL does not have a significant effect on students' grades after accounting for other contributing factors, which revealed that students entering university with BTEC+ or other qualifications received significantly lower final year grades than A-Level students (see Table B1 for model statistics). Figure 2 shows final year grades for SAIL and Non-SAIL students after accounting for these factors.

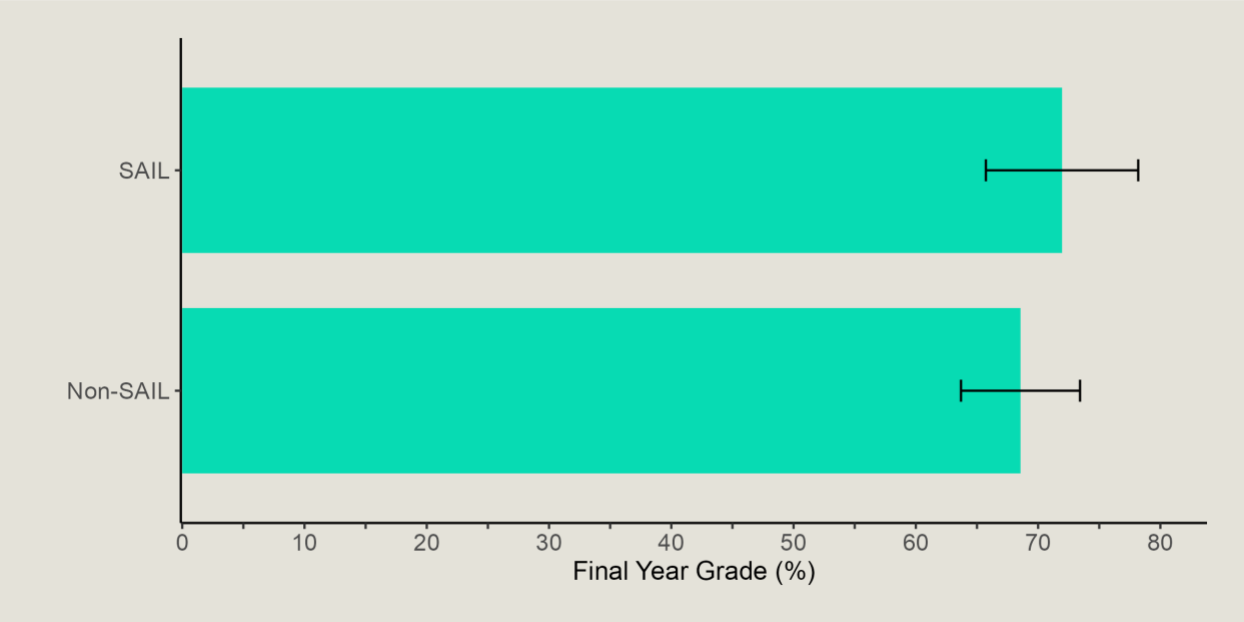

Figure 2. Final year grades for students on SAIL and non-SAIL courses (error bars show 95% confidence intervals)

RQ3: Does SAIL differentially impact BTEC+ and international students' grades, relative to those with A-Level qualifications?

Results from this model suggest that there is a significant difference in grades between BTEC+ and non-BTEC+ students, and that there is a significant interaction between Entry Qualifications and SAIL participation. However, investigation of the interaction through post-hoc tests that BTEC+ students received lower grades than non-BTEC+ students on both SAIL ($t(1609) = 7.05$, $p < .001$) and Non-SAIL ($t(1678) = 6.29$, $p < .001$) courses. There was also no difference in grade between BTEC+ SAIL and non-SAIL students ($t(1170) = 0.12$, $p = .902$). Figure 3 shows the mean grades for A-Level, BTEC+, and International SAIL and non-SAIL students, after accounting for variance from other factors. There is no significant effect of SAIL for international students.

Students entering university with BTEC+ or other qualifications received lower grades than A-Level students generally, and IMD Q1-2, mature, and students with lower UCAS points received lower grades than their IMD Q3-5, young, and higher UCAS points peers, respectively (see Table C1 for model statistics).

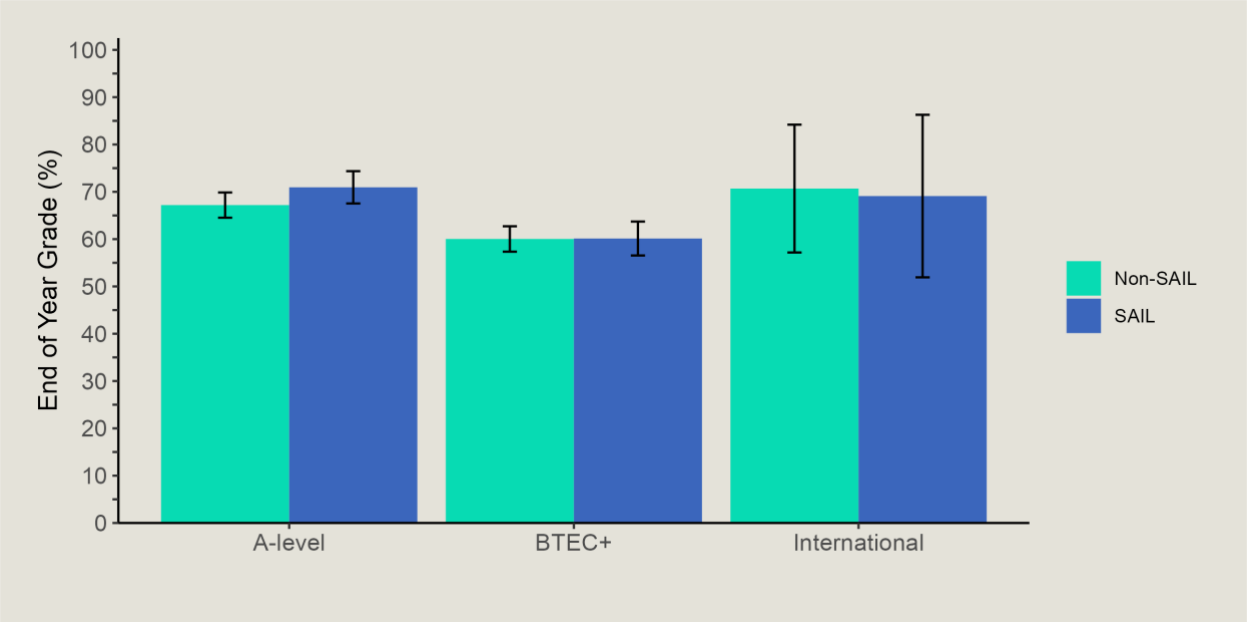

Figure 3. Mean Grades for Home A-Level and BTEC+ students, and International students on SAIL and non-SAIL courses (error bars show 95% confidence intervals)

RQ5: Does engagement with SAIL impact grades for engineering students??

To address this research question, we included only SAIL students who had passed a full academic year of modules (120 credits with module grades > 39.5%). The aggregate module grade for students submitting fewer than 8 SAIL assessments would include assessments scored at 0% (non-submissions). This therefore means that students with fewer than 8 assessments would have lower overall grades purely as an artefact of non-submissions. As we want to infer the effect of participating in SAIL in the main summative assessment, we include only students who submitted 8-11 SAIL assessments (additional analyses were include with all students, which show the same effect but stronger, for these reasons).

The number of submitted SAIL assessments above the threshold of eight significantly predicts students' module grades. After accounting for variability in students' grades associated with other variables, each additional SAIL assessment (above the threshold of eight) was associated with an increase in module grade of 1.87%.

Figure 4 shows the mean grades for different numbers of SAIL assessments submitted, after accounting for variance from other factors. BAME, students reporting disabilities, BTEC+, and International students received significantly lower grades than White,

students not reporting disabilities, A-Level, and Home domiciled students, respectively (see Table D1 for model statistics).

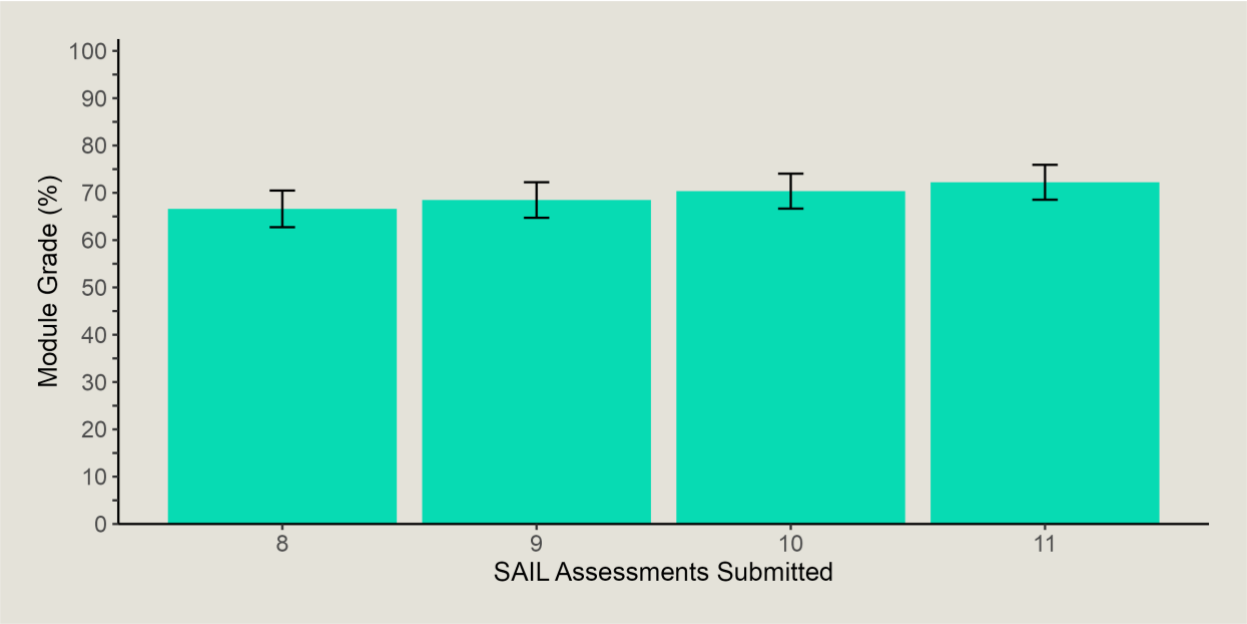

Figure 4. Mean module grade by SAIL assessments submitted (error bars show 95% confidence intervals)

RQ6: Does participation in SAIL program impact students' continuation from Level 4 to Level 5 and Level 5 to Level 6?

Results from this analysis suggest that there is no difference between SAIL and non-SAIL students in their likelihood to continue to study between programme years. Figure 5 shows the overall percentage of students not continuing their studies. BTEC+, BAME, mature, and IMD Q1-2 students were significantly less likely to continue their studies than A-Level, White, young, and IMD Q3-5 students respectively, consistent with the landscape across the sector (see Table E1 for model statistics).

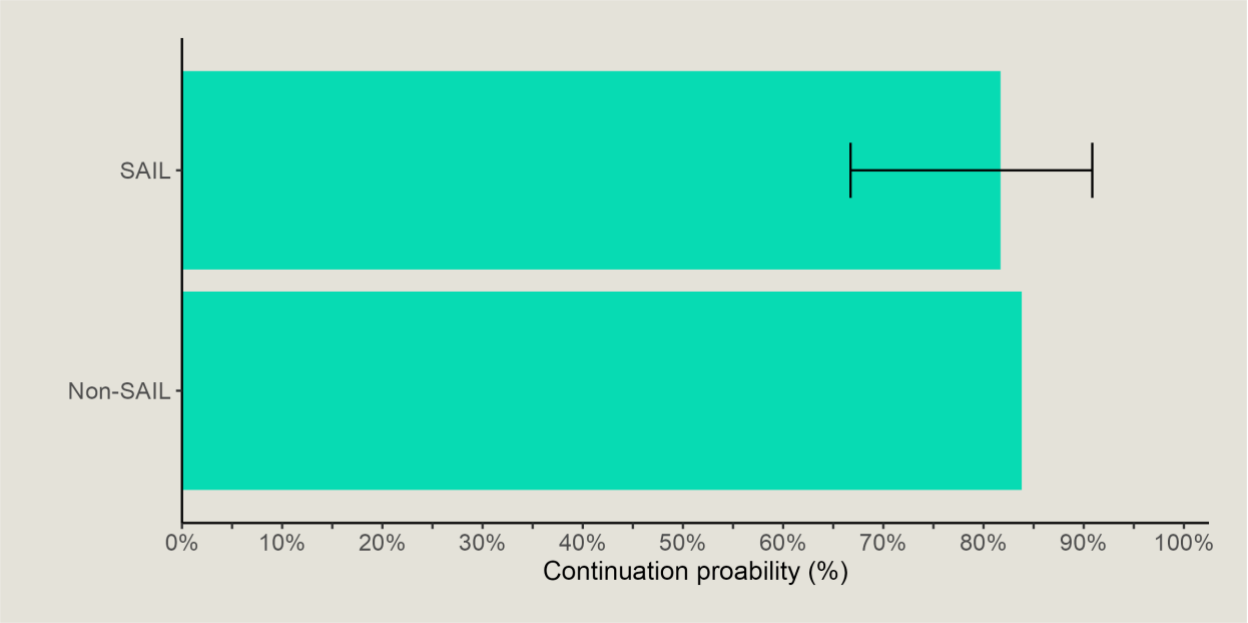

Figure 5. Probability of SAIL and non-SAIL students continuing their studies (error bar shows 95% CI).

4.4. Deviation from analysis protocol

Data were not available for the main summative submissions, which meant that research question 4 could not be addressed here. A number of other deviations were made to the trial protocol due to data limitations. While data for students degree awards were present, this was only available for a small number of students. As SAIL is intended to have a cumulative effect on attainment, we therefore calculated the mean level 6 grade (weighted by module credits) as a proxy for degree outcome. Secondly, as continuation data were not available, a proxy continuation metric was calculated by determining whether a student who would be expected to be present in the data between years (e.g. a student in level 4 in 2020/21 would be expected to be present at level 5 in 2021/22).

5. Discussion

Results from this evaluation suggest that SAIL does not have an effect on students' grades or attendance at timetabled sessions. Moreover, SAIL does not have an observable benefit for BTEC+ or international students grades or attendance at timetabled classes. On the contrary, it may be that SAIL has a beneficial effect for A-Level students. This is in contrast to the theorised mechanism of change, in developing higher education level study habits for BTEC+ and International students. With the exception of this effect, the findings broadly suggest that the mere presence of SAIL within the curriculum does not impact on students' overall grades or attendance at timetabled sessions.

However, SAIL is designed so that students can submit as many or as few assessments as they would like. When exploring the effect of SAIL on students' overall grades, we observed that, amongst students who had submitted at least eight assessment, those who submitted more SAIL assessments achieved higher stage grades, after controlling for covarying factors. One limitation of this model is that students who are more self-motivated and have already developed self-study habits may be more likely to submit more SAIL assessments, and these students may also be those who are already more likely to be awarded higher grades. This may partially be accounted for with two of the covarying factors; UCAS points and entry qualification type. That is, if we hypothesise that students entering university with more UCAS points may typically be more motivated, and that those entering with A-level qualifications may be more likely to have developed study habits suited to higher education during their previous educational experiences.

This effect is observed because engagement with SAIL is variable across Engineering students, even with the low-stakes summative enticement of the programme. We suggest that future evaluations may wish to explore students' motivations and barriers to submitting SAIL assessments. While these assessments are low-stakes, if students facing barriers' to engagement are not benefitting, it may have a particularly deleterious effect on overall attainment.

5.1. Generalisability

This evaluation used data from University of Huddersfield School of Computing and Engineering for two academic years. As such, the findings are likely to generalise within this school at the University. However, given the difference in academic cultures between schools and higher education providers, and that the sample did not include students from other providers or academic disciplines, we are unable to generalise these findings with confidence beyond this discipline at the University of Huddersfield.

5.2. Limitations

As a quasi-experimental design, we were unable to allocate students to a SAIL or non-SAIL control group directly. As such, we were unable to account for variance between students on these different courses directly. As a universal – rather than targeted - programme, SAIL does not have the disadvantage of self-selection, although students are able to decide how many SAIL assessments they submit. To account for this, we controlled for available covariates known to affect attendance and attainment (summarised in Table 6). In the LMM models, we also accounted for variance that can be explained by the nature of different courses, modules, and students. The lack of historical institutional data prevented an analysis using a differences-in-differences design.

5.3. Conclusion

While the mere presence of SAIL within the curriculum does not have a significant impact on students' attendance at timetabled classes or their resulting grades, the observed findings suggest that the more that students engage with SAIL assessments, the higher their overall grade. There are likely multiple reasons why students do or do not engage

with the SAIL programme, however we encourage future research to explore these reasons and to facilitate students in engaging in the programme.

6. Appendices

6.1. Appendix A. Research question 1: Does SAIL impact students' engagement on their course? LMM outputs

Table A1. Full table of regression coefficients, including nested random effects of course and student ID

Linear Mixed Model (LMM) Fixed Effects						
	Estimate	**SE**	**t-value**	**Low CI**	**High CI**	**p-value**
(Intercept)	53.46	4.67	11.45	44.30	62.65	<.001
SAIL (reference = non-SAIL)	2.14	1.57	1.36	-0.97	5.37	.182
Ethnicity (reference = White) BAME	-2.85	1.19	-2.39	-5.22	-0.48	.017
Ethnicity (reference = White) Unknown	-8.19	3.60	-2.28	-15.25	-1.14	.023
Programme Year	-2.64	0.44	-6.02	-3.53	-1.73	<.001
Domicile (reference = Home)	5.52	8.32	0.66	-10.81	21.85	.507
Entry Qualifications (reference = A-Level) BTEC+	-3.32	1.24	-2.69	-5.75	-0.89	.007
Entry Qualifications (reference = A-Level) Other Qualifications	-0.82	1.56	-0.52	-3.88	2.26	.601
Gender (reference = Male)	1.62	1.55	1.04	-1.43	4.67	.298
Age	0.45	0.19	2.46	0.09	0.82	.014
UCAS Points	0.09	0.01	6.13	0.06	0.12	<.001
IMD (reference = Q3-5) Q1-2	-2.48	1.17	-2.13	-4.77	-0.19	.034

Nested Random Effects		
Intercept	**Variance**	**Std. Dev**
Student ID :	274.07	16.56
Course ID	9.52	3.09
Residual	114.79	10.71

6.2. Appendix B. Research Question 2: Does SAIL impact students' degree outcomes on their course? LMM outputs

Table B1. Full table of regression coefficients, including nested random effects of course and student ID

Linear Mixed Model (LMM) Fixed Effects						
	Estimate	**SE**	**t-value**	**Low CI**	**High CI**	**p-value**
(Intercept)	-0.81	7.30	-0.11	-18.17	16.14	.911
SAIL (reference = non-SAIL)	3.40	3.70	0.92	-4.12	10.82	.365
Ethnicity (reference = White) BAME	-2.61	1.45	-1.80	-5.47	0.24	.073
Ethnicity (reference = White) Unknown	-14.15	5.43	-2.61	-24.85	-3.48	.010
Programme Year	16.25	1.40	11.63	12.76	19.84	<.001
Domicile (reference = Home)	10.94	9.17	1.19	-7.08	28.96	.234
Entry Qualifications (reference = A-Level) BTEC+	-4.43	1.52	-2.91	-7.42	-1.44	.004
Entry Qualifications (reference = A-Level) Other Qualifications	-4.73	2.00	-2.36	-8.65	-0.80	.019
Gender (reference = Male)	0.24	1.71	0.14	-3.12	3.61	.888
Age	0.14	0.19	0.75	-0.24	0.53	.456
UCAS Points	0.02	0.02	1.12	-0.02	0.06	.265
IMD (reference = Q3-5) Q1-2	-1.32	1.31	-1.01	-3.89	1.25	.314
IMD (reference = Q3-5) Unavailable	4.99	4.99	1.00	-4.82	14.80	.318

Nested Random Effects		
Intercept	**Variance**	**Std.Dev**
Student ID	25.28	4.83
Course ID	133.62	11.56
Residual	111.26	10.55

6.3. Appendix C. Research Question 3: Does SAIL differentially impact BTEC+ and international students' grades depending on their qualifications on entry to the university or home/international status? LMM outputs

Table C1. Full table of regression coefficients, including nested random effects of course and student ID

Linear Mixed Model (LMM) Fixed Effects						
	Estimate	**SE**	**t-value**	**Low CI**	**High CI**	**p-value**
(Intercept)	44.78	3.70	12.10	37.52	52.04	<.001
SAIL (reference = non-SAIL)	4.10	2.08	1.98	0.01	8.23	.051
Ethnicity (reference = White) BAME	-1.56	0.90	-1.74	-3.33	0.21	.083
Ethnicity (reference = White) Unknown	-3.19	2.49	-1.28	-8.06	1.69	.200
Domicile (reference = Home)	5.93	6.75	0.88	-7.30	19.16	.380
Programme Year	1.08	0.36	2.98	0.33	1.83	.003
Entry Qualifications (reference = A-Level) BTEC+	-6.74	1.09	-6.20	-8.87	-4.60	<.001
Entry Qualifications (reference = A-Level) Other Qualifications	-4.83	1.18	-4.08	-7.16	-2.50	<.001
Gender = Male	0.88	1.15	0.76	-1.38	3.13	.446
Age	0.46	0.14	3.33	0.19	0.73	.001
UCAS Points	0.08	0.01	7.29	0.06	0.10	<.001
IMD (reference = Q3-5) Q1-2	-2.90	0.86	-3.36	-4.58	-1.21	.001
IMD (reference = Q3-5) Unavailable	1.32	3.79	0.35	-6.12	8.76	.728
SAIL:BTEC+	-4.57	1.71	-2.68	-7.92	-1.22	.008
SAIL:International	-1.61	8.89	-0.18	-19.04	15.83	.857

Nested Random Effects		
Intercept	**Variance**	**Std.Dev**
Student ID	136.80	11.70
Course ID	34.60	5.88
Residual	78.45	8.86

6.4. Appendix D. Research Question 5: Does engagement with SAIL impact grades for engineering students? LMM outputs

Table D1. Full table of regression coefficients, including crossed random effects of module and student ID

Linear Mixed Model (LMM) Fixed Effects						
	Estimate	**SE**	**t-statistic**	**Low CI**	**High CI**	**p-value**
(Intercept)	47.24	4.07	11.59	39.22	55.31	<.001***
SAIL assessments	1.87	0.23	8.00	1.41	2.34	<.001***
Ethnicity (reference = White) BAME	-4.64	1.17	-3.97	-6.94	-2.35	<.001***
Ethnicity (reference = White) Unknown	3.78	2.69	1.41	-1.49	9.07	.160
Disability status (reference = No disability)	-4.30	1.26	-3.41	-6.78	-1.82	.001**
Academic year (reference = 2021-22)	-1.35	0.49	-2.74	-2.32	-0.38	.006**
Qualification type (reference = A-Level) BTEC+	-6.16	1.11	-5.54	-8.34	-3.97	<.001***
Qualification type (reference = A-Level) Other	-0.72	1.36	-0.53	-3.40	1.97	.596
Age	0.09	0.11	0.83	-0.13	0.32	.408

Gender (reference = Female) Male	-0.26	1.51	-0.17	-3.23	2.72	.866
IMD quintile (reference = 2-5) 1-2	-1.71	1.20	-1.43	-4.06	0.64	.154
IMD quintile (reference = 2-5) Unavailable	4.47	6.68	0.67	-8.64	17.57	.504
Domicile (reference = Home) International	-15.55	6.88	-2.26	-29.07	-2.07	.024*
Programme year	0.94	0.44	2.12	0.06	1.82	.035*

Crossed Random Effects		
Intercept	**Variance**	**Std.Dev**
Student ID	111.96	10.58
Module	35.11	5.93
Residual	98.32	9.92

6.5. Appendix E. Research Question 6: Does participation in SAIL impact students' continuation? Logistic regression output

Table E1. Full table of regression coefficients

Logistic Regression						
	Estimate	**SE**	**z-value**	**Low CI**	**High CI**	**p-value**
(Intercept)	-0.46	0.66	-0.70	-1.72	0.86	0.482
SAIL (reference = non-SAIL)	0.40	0.21	1.91	-0.01	0.81	0.057
Ethnicity (reference = White) BAME	-0.65	0.27	-2.42	-1.19	-0.13	0.016
Ethnicity (reference = White) Unknown	-14.52	674.08	-0.02	-285.25	-113.05	0.983
Programme Year	-2.55	0.28	-9.07	-3.13	-2.03	<2e-16
Domicile (reference = Home)	14.04	674.08	0.02	284.65	293.56	0.983
Entry Qualifications (reference = A-Level) BTEC+	0.63	0.30	2.12	0.06	1.22	0.034
Entry Qualifications (reference = A-Level) Other Qualifications	0.25	0.37	0.67	-0.49	0.98	0.504
Gender = Male	0.05	0.34	0.16	-0.65	0.69	0.875
Age	0.05	0.02	1.97	0.00	0.09	0.049
IMD (reference = Q3-5) Q1-2	0.22	0.27	0.83	-0.30	0.75	0.407
IMD (reference = Q3-5) Unavailable	1.53	1.22	1.25	-1.56	3.65	0.212

6.6. Appendix F. Impact Table

Outcome	Sample size	P Value	Effect	Estimated 'real world' effect	Evaluation security (1 = not at all secure 5 = very secure)	Type of evidence
What is the outcome measure? (include primary and secondary outcomes)	*How many participants were included in the study relating to this outcome?*	*Report the p-value derived from the statistical tests*	*Report the size of the effect - confidence intervals/Cohen's d / Cohen's h*	*Where possible, please translate the effect size into a tangible example of the size of the effect - e.g., 13 more students apply to HE*	*See evaluation security note[2]*	*Is it Type 1,2 or 3 evidence - according to the OfS standard of evidence?*
Weekly attendance	1867	.182	0.06	-	2.8	2
level 6 grade	1867	.365	0.05	-	3	2
Module grade	1867	<.001	0.04	-	3	2
Continuation	1867	.056	0.08	-	3	2

[2] *Based on the decisions made around the evaluation, you will be able to assess the security of your evaluation – that is, how confident you can be when making claims about the findings. The most robust evaluations with large samples, low attrition levels and no threats to validity will receive the highest score of 5/5.*